Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

April 27, 2011

Ms. Liz Sewell, P.G.
Project Manager
ARCADIS
950 Glenn Drive, Suite 125
Folsom, California 95630

DRAFT REMEDIAL ACTION PLAN FOR THE FRONT & "T" STREET SITES, SACRAMENTO, CALIFORNIA

Dear Ms. Sewell:

The Department of Toxic Substances Control (DTSC) has completed review of the Draft Remedial Action Plan (draft RAP) dated April 27, 2011. The Draft RAP was prepared by ARCADIS for the Pacific Gas and Electric Company (PG&E). PG&E has taken a primary role in the coordinated remediation of the PG&E manufactured gas plant site, CalTrans I-5 Q Street off-ramp site, the SHRA 1920 Front Street site and the SMUD Front & "T" site. These sites are collectively referred to as the "Front & "T" Street sites." The draft RAP has been prepared in accordance with California Health and Safety Code 25356.1. A draft RAP presents the remedy selection process and a proposal to implement the selected remedy. The Draft RAP presents the selected remedial alternative, In-situ Soil Stabilization / Solidification (ISSS). Implementation of ISSS will encapsulate the contamination in the areas of highest impact and inhibit the release of those contaminants into the groundwater which flows beneath the site. The implementation of this remedy is protective of groundwater and will remove impediments from planned future development in this area. The Draft RAP is complete, acceptable and prepared in accordance with Departmental policies and at this time, it is appropriate to release the document for public comment.

With this approval PG&E will perform the following tasks related to the public comment period:

- Publish the approved Public Notice in the Sacramento Bee on Friday April 29th;
- Make revisions to the Fact Sheet as directed by DTSC and mail the Fact Sheet to all persons/groups on the approved mailing list; and
- Place a copy of the Draft RAP in the information Repository.

We look forward to holding a public meeting to receive public comment on and present the draft RAP.

Thank you for your continued attention and cooperation in this on-going remediation. Should you have any questions, please contact me at (916) 255-6583.

Sincerely,

Sam V. Martinez, Jr., P.E.
Hazardous Substances Engineer
Brownfields & Environmental Restoration Program

cc: **(All via e-mail)**

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Department of Toxic Substances Control

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Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

DRAFT REMEDIAL ACTION PLAN
APPROVAL RECORD

Site Name: PG&E Front & T Street Site
2000 Front Street
City of Sacramento
County of Sacramento
State of California

I have reviewed or been briefed on the Draft Remedial Action Plan prepared by ARCADIS on behalf of the Pacific Gas & Electric Company. The document is complete, acceptable and prepared in accordance with Departmental policies. I concur that release to the public for a comment period of no less than 30 days is appropriate.

Sam V. Martinez, P.E., Project Manager — Date 4/26/2011

Richard B. Hume, P.E., Chief
National Priorities List Unit — Date 4/24/2011

Charlie Ridenour, Performance Manager
Brownfields and Environmental Restoration Program — Date 4/26/2011

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Infrastructure, environment, facilities

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Mr. Sam Martinez, Jr.
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826-3200

ENVIRONMENT

Subject:
Draft Remedial Action Plan
PG&E Front and T Street Site, Sacramento, California

Dear Mr. Martinez:

Date:
27 April 2011

Please find attached two copies of the *Draft Remedial Action Plan* (RAP) for the Pacific Gas and Electric Company (PG&E) Front and T Streets site located in Sacramento, California. A copy of the document is also included as a portable document file (PDF) and a Microsoft Word file on the attached compact disc.

If you have any questions regarding this report, please contact me at 916-786-5535.

Sincerely,

ARCADIS

Liz Sewell, PG
Project Manager

Contact:
Liz Sewell

Phone:
916-786-5535

Email:
Liz.Sewell@arcadis-us.com

Our ref:
RC000661.009I

Attachments

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ARCADIS
Infrastructure, environment, facilities

Imagine the result

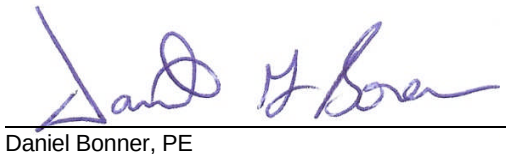
Pacific Gas and Electric Company

Draft Remedial Action Plan

PG&E
Front and T Streets Site
Sacramento, California

27 April 2011

ARCADIS



Daniel Bonner, PE
Senior Engineer

Alison Jones, PE, Ph D
Engineer of Record

Liz Sewell, PG
Project Manager

Draft Remedial Action Plan

PG&E
Front and T Streets Site
Sacramento, California

Prepared for:
Pacific Gas and Electric Company

Prepared by:
ARCADIS
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California 94104
Tel 415.374.2744
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Our Ref.:
RC000661.009I.CF001

Date:
27 April 2011

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Acronyms and Abbreviations

AAL	applied action levels
AOC	area of concern
ARAR	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
AQMD	Sacramento Metropolitan Air Quality Management District
B(a)P	benzo(a)pyrene
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
Caltrans	California Department of Transportation
cm/sec	centimeters per second
COCs	contaminants of concern
CQAP	Construction Quality Assurance Plan
CQCP	Construction Quality Control Plan
CSM	conceptual site model
DHS	California Department of Health Services
DO	dissolved oxygen
DTSC	Department of Toxic Substances Control
DVMP	Dust and Vapor Monitoring Plan
EE/CA	engineering evaluation/cost analysis
ERH	electrical resistance heating
ESL	environmental screening levels
GAC	granular activated carbon
GCL	geosynthetic clay liner
gpd	gallons per day
gpm	gallons per minute
GWETS	groundwater extraction and treatment system
HASP	health and safety plan
ISSS	*in-situ* soil stabilization / solidification
ISTD	*in-situ* thermal desorption
LUC	land use covenant
MCL	maximum contaminant level
MGP	manufactured gas plant
msl	mean sea level
NAPL	non aqueous phase liquid
NCP	National Contingency Plan
NPV	net present value
O&M	operation and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
ORC	oxygen release compound
ORP	oxygen reduction potential
PAHs	polycyclic aromatic hydrocarbons
PC	Portland cement

PG&E	Pacific Gas and Electric Company
PID	photoionization detector
PPE	personal protective equipment
psi	pounds per square inch
QA	quality assurance
QC	quality control
RAO	remedial action objective
RAP	remedial action plan
RAW	remedial action workplan
RWQCB	Regional Water Quality Control Board, Central Valley Region
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SHRA	Sacramento Housing and Redevelopment Agency
Site	Pacific Gas and Electric Company Front and T Streets site located in Sacramento, California
SMUD	Sacramento Municipal Utility District
SRCSD	Sacramento Regional County Sanitation District
SVETS	soil vapor extraction and treatment system
TBC	to be considered materials
TPH	total petroleum hydrocarbons
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

Executive Summary

ARCADIS U.S. Inc., (ARCADIS) has prepared this draft *Remedial Action Plan* (*RAP*) on behalf of Pacific Gas and Electric Company (PG&E) for the Front and T Streets site (Site) located in Sacramento, California. The draft RAP has been prepared in accordance with California Health and Safety Code 25356.1. A draft RAP presents the remedy selection and a proposal to implement a preferred remedy for a hazardous substance release site. The public is encouraged to submit comments and participate in the remedy selection process. A fact sheet summarizing the major details of the draft RAP is mailed to interested parties. The fact sheet describes the RAP process, specifies the beginning and ending dates of the public comment period on the draft RAP, and provides notice of the time and location of a public meeting to discuss the draft RAP. Regulatory and public outreach documents associated with the RAP are included in Appendix A. Following the public comment period, the Department of Toxic Substances Control (DTSC) will prepare the final RAP by revising the draft RAP. DTSC will at a minimum add the following to the draft RAP:

- A responsiveness summary which includes a formal response to public comments;
- A copy of the public notice;
- A copy of the fact sheet circulated during the public comment period; and
- A copy of the minutes or notes from the public meeting held near the Site during the comment period.

These documents will be combined to form the final RAP. Once DTSC adopts the final RAP, PG&E will be directed to take the appropriate steps to implement the plan.

The Site is comprised of four individual parcels: the PG&E Sacramento Manufactured Gas Plant (MGP) Site; the California Department of Transportation (Caltrans) 1-5 Q Street Off-ramp Site; the Sacramento Housing and Redevelopment Agency (SHRA) 1920 Front Street Site; and the Sacramento Municipal Utility District (SMUD) Front and T Street Site.

PG&E or predecessor companies operated a MGP on the PG&E parcel at 2000 Front Street between 1873 and 1930. Residuals of the manufactured gas process include lampblack, tar, total petroleum hydrocarbons (TPH), and spent oxides. Contaminants associated with these residues have been detected in soil and groundwater beneath the Site. The primary contaminants of concern (COCs) in both soil and groundwater

are benzene, toluene, ethylbenzene and xylenes (BTEX), and polycyclic aromatic hydrocarbons (PAHs) including naphthalene.

Numerous remedial investigations, soil removal actions, and many years of groundwater extraction and treatment have been conducted at the Site. Key documents from the administrative record are included in Appendix B of this RAP.

Based on past investigations, residual contamination remains tied up in the finer soil of the uppermost saturated zone (depths of approximately 18 feet below ground surface [bgs]) and extends into immediately underlying soils, typically extending to depths of between 25 and 40 feet bgs. Exposure to contamination at the PG&E parcel remains a concern because of the presence of COCs in soil, groundwater, and soil vapor. Residual mass in soil that could be an ongoing source for groundwater impacts is confined within the boundaries of the PG&E parcel and found in three areas: the west-central portion, the central portion, and the northeastern portion. The highest concentrations of dissolved-phase COCs in groundwater have historically been found in the central portion of the PG&E parcel. The northeastern and west-central portions of the parcel have typically shown dissolved COC concentrations an order of magnitude less than the central area. PAHs and BTEX concentrations in soil vapor generally correspond with areas of the Site where higher concentrations of PAHs and BTEX had previously been detected in soil and/or groundwater samples.

Remedial activities to date include: capping of the PG&E property with a geosynthetic clay liner (GCL), soil excavations, operation of a soil vapor extraction and treatment system (SVETS), and operation of a groundwater extraction and treatment system (GWETS). Additionally, land use covenants (LUCs), as discussed in Section 2.4, enhance control over the risk of exposure to any remaining COCs at the Site have been recorded in Sacramento County for each of the parcels. The LUC for the PG&E parcel restricts human habitation including residences, hospitals, schools for persons under age 21, day-care centers, hotels, motels, or residences for employees. The PG&E covenant also restricts the disturbance of the existing asphalt cap over the property, and requires that the DTSC be notified prior to a change in property ownership.

In an effort to accelerate the time to Site closure, PG&E is proposing an enhancement to the current groundwater remedy that is focused on reducing and/or controlling the residual hydrocarbon mass that represents a potential ongoing source of impacts to groundwater and soil vapor. The focus of this *RAP* is on the PG&E parcel, as remedial action certifications for the other parcels have been completed.

The objectives of this RAP are to: provide a screening of potentially applicable remedial alternatives; summarize the remedy selection process; present the preferred remedial alternative; and inform the public of how to become involved in the process. The desired remedial alternative will: (a) reduce and/or control the residual mass that represents a potential ongoing source of chemical impacts to groundwater and soil vapor; and (b) treat the residual mass sufficiently so that the dissolved-phase plume is addressed by natural attenuation processes alone.

The current approved remedy for groundwater remediation at the Site is based on the assumption that remedial action objectives (RAOs) will be achieved by continued operation of the GWETS and SVETS, intrinsic biodegradation, and hydraulic containment via the Ranney Collector. Hydraulic conditions at the Site have changed following the shutdown of the Ranney Collector in 2009, necessitating a re-evaluation of the groundwater remedial strategy at the Site. Additionally, the current approved remedy does not include a time frame or strategy for shut down of the GWETS. If the rate of contaminant removal by the GWETS were assumed to be constant it would take 400 years to extract the BTEX compounds and over 1,050 years to reduce the PAHs.

Various technologies to enhance the current groundwater remediation strategy were identified and evaluated. Technologies that are likely to be effective and that would be relatively easy to moderately complicated to implement were retained for further consideration and included: continued operation of the GWETS; operation of an expanded GWETS; installation of a physical barrier; and *in-situ* soil stabilization / solidification (ISSS).

Based on an evaluation of the remedial alternatives against criteria set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300) and California Health and Safety Code Section 25356.1(d), ISSS has been found to be the recommended remedial alternative for this Site. Of the solutions considered, ISSS would require the least amount of monitoring and maintenance to remain protective of human health and the environment and would be the most effective of the solutions considered in the long-term. Additionally, ISSS best meets the Environmental Protection Agency's (EPA's) preference for reduction of toxicity, mobility and volume through treatment although some increase in volume will occur as a result of ISSS treatment. ISSS will likely attain the cleanup levels within approximately 5 years and will therefore be effective in the short-term. ISSS will also be effective in the long term because it binds residual COCs in a solid matrix and therefore it reduces the mass transfer of COCs from the soil matrix to the groundwater.

The total time required to implement ISSS is estimated to be 9 to 11 months. Completion of the ISSS will be followed by continued operation of the GWETS system and groundwater monitoring until the cleanup levels are achieved. Preliminary groundwater modeling indicates that the GWETS will need to operate for up to 5 years following completion of the ISSS.

Following the implementation of the ISSS alternative, maintenance of the GCL cap to limit surface water infiltration and decrease the potential for transport of COCs from affected soil to groundwater will no longer be necessary. The existing LUC for the PG&E parcel should be modified to include maintenance of a clean soil cover / vegetated cap or asphalt cap to minimize physical contact with the subsurface.

The current LUC prevents the PG&E parcel from being used for residential purposes and prevents exposure to the soil nearest to the surface. Given that contamination will remain at the Site, this prohibition will remain. However, the LUC will be updated to reflect the implementation of ISSS and to include a map of the areas and depths of ISSS treatment. Following the implementation of ISSS, concentrations in groundwater at the compliance point are projected to be reduced to below RAOs within 5 years. It is estimated that PG&E will be in a position to request a remedial action certification for the PG&E parcel approximately 4 years after implementation of ISSS, toward the end of 2016. Once RAOs are achieved and all appropriate controls are in place, DTSC will issue a certification for the PG&E parcel.

1. Introduction

ARCADIS U.S. Inc., (ARCADIS) has prepared this *Remedial Action Plan* (*RAP*) on behalf of Pacific Gas and Electric Company (PG&E) for the Front and T Streets site (Site) located in Sacramento, California (Figure 1). The RAP has been prepared in accordance with California Health and Safety Code 25356.1. The RAP is the DTSC's remedy selection document for hazardous substance release sites. The public is encouraged to submit comments and participate in the remedy selection process. A fact sheet summarizing the major details of the RAP will be mailed to interested parties. The fact sheet will specify the beginning and ending dates of a 30-day public comment period, and the time and location of a public meeting. Regulatory and public outreach documents associated with the RAP are included in Appendix A.

The Site is comprised of four individual parcels (Figure 2): the PG&E Sacramento Manufactured Gas Plant (MGP) Site; the California Department of Transportation (Caltrans) 1-5 Q Street Off-ramp Site; the Sacramento Housing and Redevelopment Agency (SHRA) 1920 Front Street Site; and the Sacramento Municipal Utility District (SMUD) Front and T Street Site.

In an effort to accelerate the time to Site closure, PG&E is proposing an enhancement to the current groundwater remedy that is focused on reducing and/or controlling the residual hydrocarbon mass that represents a potential ongoing source of impacts to groundwater and soil vapor. The focus of this *RAP* is on the PG&E parcel, as remedial action certifications for the other parcels have been completed.

Soil remediation on the PG&E parcel is complete, having consisted of various soil removal actions and the construction of an engineered cap. The approved remedy for groundwater remediation is intrinsic biodegradation of the adsorbed and dissolved contaminants of concern (COCs), along with operation of groundwater and soil vapor extraction and treatment systems (GWETS and SVETS), maintenance of the cap on the PG&E parcel, hydraulic containment by production from the Ranney Collector, and land use covenants on each parcel (Geomatrix 2001). This strategy was approved by the DTSC and the California Regional Water Quality Control Board, Central Valley Region (RWQCB) on April 27, 2001, and subsequently implemented at the Site.

On January 2, 2007 the SVETS was shut down and the above ground equipment decommissioned. In August 2009, the Ranney Collector well was shut-down; accordingly the DTSC requested implementation of a contingency remedy in a letter dated July 29, 2009 (DTSC 2009b). In response, ARCADIS recommended modifications to the GWETS (ARCADIS 2009d), including the installation of two

additional extraction wells. This RAP has been prepared to provide recommendations for further enhancements to the groundwater remedial action at the Site.

1.1 Objectives

The objectives of this RAP are to: provide a screening of potentially applicable remedial alternatives; summarize the remedy selection process; present the preferred remedial alternative; and inform the public of how to become involved in the process. The preferred remedial alternative will: (a) reduce and/or control the residual mass that represents a potential ongoing source of chemical impacts to groundwater and soil vapor; and (b) treat the residual mass sufficiently so that the dissolved-phase plume is addressed by natural attenuation processes alone.

1.2 Report Organization

This RAP is organized as follows:

- Section 2 – Site Background: A summary description of the Site, its history, and the remedial actions completed to date.
- Section 3 – Conceptual Site Model: A description of the conceptual Site model (CSM), Site hydrogeology, and the nature and extent of Site contamination.
- Section 4 – Remedial Action Objectives: A review of Site remedial action objectives (RAOs).
- Section 5 – Alternative Remedial Solutions and Recommended Alternative: Conclusions and recommendations for the selection of a site-appropriate remedial action for the PG&E parcel, based on the comparative analysis of remedial alternatives that can be used to achieve site RAOs.
- Section 6 – Treatment Area for Remedial Action Implementation: Summary of the footprint of the proposed treatment area.
- Section 7 – Schedule: A remedial action implementation schedule.
- Section 8 – Modifications to the Land Use Covenant and Remedial Action Certification for the PG&E parcel: Recommendations for modifications to the land

use covenant (LUC) and an outline of the steps and timing for certification of the PG&E parcel.

- Section 9 – References: A list of works cited within this RAP.

2. Site Background

2.1 Site Description

The Site consists of multiple undeveloped parcels along Front Street that are currently owned by PG&E, Caltrans, SMUD and SHRA (Figure 2). In April 2001, PG&E assumed responsibility for remediating the Site through the execution of settlement agreements with each of the other three property owners (SHRA, Caltrans, and SMUD).

The Site is bordered by undeveloped land to the north, a railroad track and the Sacramento River to the west, and commercial properties to the south and the east. Except at the levee along the western edge of the Site, the Site is essentially level with a gradual slope to the east. Monitoring wells are located on each parcel and within the Front Street right-of-way (Figure 2).

The approximately 5.2-acre PG&E parcel is covered with a DTSC-approved engineered cap, with the exception of a relatively small portion in the north-east corner of the parcel and a small portion in the vicinity of buried pipelines along the southern border. The cap consists of a top surface of chip seal, above 6 inches of aggregate base, over 2 inches of sand above a geosynthetic clay liner (GCL). Imported backfill or native soils are located immediately beneath the clay liner. The PG&E parcel is the location of the GWETS.

2.2 Site History

PG&E or predecessor companies operated a MGP on the PG&E parcel at 2000 Front Street between 1873 and 1930. The plant was then placed on standby until 1956, and was demolished in 1961.

Residuals of the manufactured gas process include lampblack, tar, total petroleum hydrocarbons (TPH), and spent oxides. Contaminants associated with these residues have been detected in soil and groundwater beneath the Site. The primary COCs in both soil and groundwater are benzene, toluene, ethylbenzene and xylenes (BTEX), and polycyclic aromatic hydrocarbons (PAHs) including naphthalene.

The Caltrans and SMUD parcels were part of the Friend and Terry Lumber Company Complex where a lumber facility was operated beginning in 1915. Caltrans purchased

the parcels in the 1960s. SMUD acquired its parcel from Caltrans in 1967 and operated an electrical distribution substation between 1967 and 1991.

The SHRA parcel was also part of the Friend and Terry Lumber Company Complex and contained an underground storage tank (UST) installed in 1945. SHRA acquired the parcel in 1986 and removed the UST in 1988.

2.3 Remedial Actions to Date

Numerous remedial investigations, soil removal actions, and many years of groundwater extraction and treatment have been conducted at the Site. Remedial activities to date include: capping of the PG&E property with a GCL, soil excavations, operation of a SVETS, and operation of a GWETS. The remedial actions and associated documentation are summarized in Table 1. Key documents from the administrative record are included in Appendix B.

2.3.1 Soil Excavation

Between August and November 1991, PG&E excavated approximately 46,000 cubic yards (approximately 80,000 tons) of chemically impacted soil from the PG&E parcel. Soil was excavated down to the water table to maximum depths of between 14 and 21 feet below ground surface (bgs). The excavations were backfilled with imported material and the parcel was re-graded to drain surface water to the eastern edge of the property at Front Street. In August 1995, a GCL was installed across most of the parcel to minimize the possibility of direct human contact with residual soil contamination, and to limit surface water infiltration in order to decrease the potential for transport of COCs from affected soil to groundwater. The GCL was installed over imported backfill and native soils. A two-inch layer of sand followed by a 6-inch layer of aggregate base was compacted over the GCL, and the entire parcel was paved with approximately 2 inches of asphaltic concrete.

In December 1996, SHRA excavated approximately 200 cubic yards of gasoline-impacted soil in the vicinity of a former UST removed in 1988. Soil was excavated to a maximum depth of approximately 25 feet bgs. To enhance bioremediation of remaining hydrocarbons in soil and groundwater, the excavation was backfilled to a depth of approximately 11 feet bgs with a mixture of gravel and Oxygen Release Compound® (ORC). Additional soil was excavated at the SHRA parcel in 2001 and 2002.

Between October 1998 and March 1999, approximately approximately 20,450 tons of chemically impacted soil was excavated from the Caltrans and SMUD parcels. Soil was

excavated to the upper aquitard to a maximum depth of approximately 10 to 19 feet bgs. A GCL was placed at the bottom of the excavation prior to backfilling with Class 3 permeable material and imported soil. In total, approximately 100,000 tons of impacted soil was excavated from the various parcels that comprise the Site between 1991 and 2002.

2.3.2 Soil Vapor Extraction

A SVETS was installed on the Caltrans parcel in 1999 to remediate impacted soil beneath the excavation and remove a potential source of COCs to groundwater. The SVETS consisted of nine vapor extraction wells, three groundwater monitoring wells and a catalytic oxidizer to treat the extracted vapors. The system typically operated between late spring and early winter when groundwater levels were low. In October 2006, ARCADIS recommended permanent shutdown of the system due to low mass removal rates and a minimal effect on groundwater quality (ARCADIS 2006). The DTSC approved the request in a letter dated December 19, 2006 (DTSC 2006), and the SVETS was shut down on January 2, 2007. Following DTSC approval, a *SVETS Decommissioning Plan* (ARCADIS 2007b) was drafted and approved in May 2007 that described a two-phased approach to decommissioning the system. Phase 1 involved termination of all utilities and removal of the oxidizer, blower, and above-ground equipment and process piping. Phase 2 involved removal of the vapor extraction wells and vaults.

Phase 1 of the decommissioning plan was completed in July 2007. All aboveground equipment, process piping, and electrical components were removed. All subsurface components of the system, such as conduit and piping, remain. Phase 2 of the decommissioning plan will be completed in conjunction with well abandonment activities conducted during the implementation of this RAP.

2.3.3 Groundwater Extraction and Treatment

A GWETS was installed on the PG&E parcel in August 1995 to remove and treat chemically impacted groundwater along the eastern edge of the parcel. Contaminants in the extracted groundwater are treated using two 10,000-pound granular activated carbon (GAC) vessels arranged in series and discharged to the Sacramento Regional County Sanitation District (SRCSD) sanitary sewer. The system includes four extraction wells (EX-1 through EX-4) at the northeast corner of the parcel. Two additional extraction wells (EX-5 and EX-6) were installed in December 2009 along the eastern property boundary and were connected to the system in June 2010 following

relocation of the treatment compound (ARCADIS 2010d). The GWETS is currently treating groundwater extracted from all six extraction wells.

A total of approximately 151 million gallons of groundwater were extracted, treated, and discharged between August 1995 and December 2009. Approximately 209 pounds of BTEX and 846 pounds of PAHs have been removed from groundwater at the Site since 1995, and total contaminant recovery as a percent of total contaminant mass has been very small (approximately 3.5 percent for BTEX and 1.3 percent for PAHs). If the rate of contaminant removal by the GWETS were assumed to be constant it would take 400 years to extract the BTEX compounds and over 1,050 years to reduce the PAHs.

The GWETS compound was relocated from the northeast corner of the parcel to the central-eastern property boundary between April and June 2010 (ARCADIS 2010d) to accommodate the additional groundwater remedy enhancements discussed in this RAP, which will require physical access to soils in the northeastern portion of the Site. Groundwater modeling results (ARCADIS 2009b) indicate that groundwater extraction wells (EX-5 and EX-6) pumping at a rate of approximately 12.5 gallons per minute (gpm) each will provide complete capture of the plume, and can replace existing extraction wells EX-1 through EX-4. Results of the groundwater modeling are included as Appendix C.

2.4 Land Use Covenants

Land use covenants (LUCs; deed restrictions) have been recorded in Sacramento County for each of the parcels and can be found on the Envirostor website at: http://www.envirostor.dtsc.ca.gov/public/deed_restrictions.asp. These land use covenants enhance control over the risk of exposure to any remaining COCs at the Site as follows:

- A LUC was recorded for the PG&E parcel on May 19, 1993. Restrictions include no human habitation including residences, hospitals, schools for persons under age 21, day-care centers, hotels, motels, or residences for employees. Additionally, the covenant restricts the disturbance of the existing asphalt cap over the property. The covenant requires DTSC to be notified prior to any change of property ownership.

- A LUC was recorded for the Caltrans parcel on July 12, 2006. The covenant restricts the parcel to industrial and commercial use and prohibits residences, hospitals, schools for persons under age 21, day care centers, and long-term care

facilities. The covenant prohibits activities that may disturb required remedial systems, or interfere with the operation or maintenance (O&M) of the remedial systems. Additionally, the covenant prohibits the extraction of groundwater other than for remediation, activities that may disturb soils beneath the GCL or the GCL itself; and injection of any compound into soil or groundwater other than for remediation. The covenant requires DTSC to be notified prior to any change of property ownership. The covenant also requires the property transferee to be notified of the presence of hazardous substances beneath the property. A Soil Management Plan is required for any contaminated soil to be removed from the property.

- A LUC was recorded for the SHRA parcel on November 7, 2006. The covenant prohibits activities that may disturb required remedial systems or interfere with the O&M of the remedial systems. Additionally, the covenant prohibits the extraction of groundwater other than for remediation, activities that may disturb contaminated soil, and injection of any compound into soil or groundwater other than for remediation. The covenant requires DTSC to be notified prior to any change of property ownership. The covenant also requires the new property owner to be notified of the presence of hazardous substances beneath the property.

- A LUC was recorded for the SMUD parcel on November 17, 2006. The covenant restricts the parcel to industrial and commercial use and prohibits residences, hospitals, schools for persons under age 21, day care centers, and long-term care facilities. The covenant prohibits activities that may disturb or interfere with required remedial systems including the O&M of the remedial systems. Additionally, the covenant prohibits the extraction of groundwater other than for remediation, disturbance of soils below 10 feet bgs, and injection of any compound into soil or groundwater other than for remediation. The covenant requires DTSC to be notified prior to any change of property ownership. The covenant also requires the new property owner to be notified of the presence of hazardous substances beneath the property. A Soil Management Plan is required for any contaminated soil to be removed from the property.

2.5 Remedial Action Certifications

Remedial action certifications were completed by DTSC for the SHRA, Caltrans, and SMUD parcels on April 30, 2008. The remedial action certification for each of the parcels states that DTSC has determined that all appropriate removal/remedial actions have been completed and that all acceptable engineering practices were implemented; however, the Site requires ongoing O&M and monitoring efforts. With the completion of

the certification process, these parcels have been deleted from DTSC's active site list, and placed on the list of sites undergoing O&M to ensure proper monitoring of long-term clean-up efforts.

Remedial action certification for the PG&E parcel will be completed following implementation of the remedial actions proposed in the final RAP and once the Remedial Action Objectives set forth in the RAP are attained. The certification will state that DTSC has determined that all appropriate removal/remedial actions have been completed and that all acceptable engineering practices were implemented; however, the Site requires ongoing O&M. With the completion of the certification process, the parcels will be deleted from DTSC's active site list, and placed on the list of sites undergoing O&M to ensure proper monitoring of long-term cleanup efforts.

3. Conceptual Site Model

The CSM for the Site is described in the sections below and depicted in Figure 3.

3.1 Site Hydrogeology

The Site is located along the Sacramento River in the Southeastern portion of the Sacramento Valley approximately 1.6 miles south of the confluence of the American and Sacramento Rivers. The uppermost portion of the Site consists of fill. Fill material has typically been described as brown silty sands; however construction debris such as wood, wire, bricks and concrete has also been observed within the fill.

The native geology consists of fluvial sediments including clays, silts, sands and gravel. Native sediments have typically been described as gray to greenish gray, in contrast with the fill materials, which are typically brown. The subsurface lithology at the Site consists of interbedded, high permeability aquifers and low permeability aquitards (Geomatrix 2001), as described below.

- Unit 1 Surficial Deposits: This unit consists of top soil and/or fill and extends from the ground surface to a depth of between 2 to 15 feet bgs.

- Unit 2 Aquitard: This unit consists of mostly silts, clayey silts and lean clays and extends from the bottom of Unit 1 down to 15 to 25 feet bgs.

- Unit 3 Aquifer: This unit consists of medium-grained, unconsolidated sands and extends from approximately 25 feet to 85 feet bgs. The Unit 3 Aquifer is fully saturated year round at the PG&E parcel and has several feet of seasonally unsaturated material at the Caltrans and SMUD parcels. Three subunits have been identified within Unit 3, as follows:

  - Subunit 3A: The upper portion (approximately 25 to 64 feet bgs) consists of poorly graded sand.
  - Subunit 3B: The middle portion (approximately 64 to 65 feet bgs) consists of silt and clay, approximately 1 foot thick and is characterized by low permeability (former Middle Unit Aquitard).
  - Subunit 3C: The bottom portion (approximately 65 to 85 feet bgs) consists of gravel to gravelly sands.

- Unit 4 Aquitard: This unit consists of silts and clays and extends from approximately 85 to 130 feet bgs.

- Unit 5 Aquifer: This unit consists of sands, gravels and clays and extends from approximately 130 to 400 feet bgs.

A cross section location map (Figure 4) and four cross sections (Figures 5 through 8; cross sections D through G) display the Site geology and COC distribution.

Site groundwater monitoring began in 1986. Groundwater flow is strongly influenced by the Sacramento River, which serves as the primary source of recharge to the flow system and controls groundwater elevations. Prior to decommissioning in August 2009, local groundwater flow was also influenced by two production wells: the Ranney Collector, screened within Subunit 3C; and the Front Street Well, screened within Unit 5. Groundwater flow directions are generally west to east, away from the Sacramento River.

The Sacramento River is approximately 600 feet wide and flows to the southwest near the Site. The highest river stage (22 to 30 feet above mean sea level [msl]) is typically observed during winter months, and the lowest river stage (3 feet above msl) is typically observed between May and November. Groundwater elevations are also tidally influenced. The Sacramento River fluctuates twice daily between 1 and 2 feet (cycling twice every 25 hours), changing groundwater elevations approximately 0.5 feet (Geomatrix 1999). The effects on groundwater elevation at the Site dissipate exponentially with distance from the shoreline and do not cause significant changes in groundwater flow direction or velocity.

Prior to decommissioning in August 2009, the Ranney Collector caused groundwater beneath the Site to migrate in a northeasterly direction. Groundwater extracted from the Ranney Collector was used in the heat exchange system for nearby State buildings. The Ranney Collector was installed in 1967 and extracted groundwater year round via laterals installed approximately 80 feet bgs. The maximum pumping capacity of the Ranney Collector was 15.8 million gallons per day (gpd), or 11,000 gpm. During the winter months when the demand for cooling water was less, the Ranney Collector typically pumped 2,200 gpm or less. During the daytime hours of the summer months, the well often pumped 8,800 gpm or more.

Prior to decommissioning in August 2009, the Front Street Well served as a supply well to supplement the Ranney Collector during periods of high cooling water demand. The Front Street Well was installed in 1977, and was operated during peak demand periods for the Capital Mall heat exchange system. The well was screened between 130 and 400 feet bgs and had a maximum capacity of 2,200 gpm. The well was completed

below the Unit 4 Aquitard, and had no hydraulic influence on Unit 3 groundwater monitored at the Site.

First encountered groundwater occurs under confined to semi-confined conditions at depths ranging from approximately 18 to 28 feet bgs. Groundwater velocity is relatively high at 5.4 feet/day (based on an average hydraulic conductivity of 53.9 feet/day; hydraulic gradient of 0.01 feet/foot; and effective porosity of 0.10). Prior to August 2009, the horizontal groundwater flow direction was typically east, then north-northeast towards the Ranney Collector. Following shutdown of the Ranney Collector, groundwater flow direction is expected to reestablish itself in an easterly direction. Groundwater elevations typically range between approximately -1 and 10 feet msl depending on the time of year and the proximity to the Sacramento River. Horizontal gradients in Subunit 3A of the Unit 3 Aquifer are typically 0.01 or less, also depending on river stage.

ARCADIS has estimated vertical gradients at five well pairs from various locations and units representing the Site. Both upward and downward vertical gradients have been observed between the shallow and intermediate units beneath the Site (ARCADIS 2010a; ARCADIS 2011a).

3.2 Nature and Extent of Contamination

As discussed in Section 2.2, MGP residuals in soil continue to be the primary source of chemicals to groundwater at the Site. Residuals from operations on the PG&E parcel include lampblack, tar, TPH, and spent oxides. The primary COCs which have impacted soil and groundwater beneath the Site are BTEX and PAHs including naphthalene. COCs have been detected in Unit 1 unsaturated soils and extend into Unit 2 Aquitard and upper Unit 3 Aquifer unsaturated and saturated soils. Soil impacts appear to be associated with multiple release points. Numerous remedial strategies have been implemented on the individual parcels since 1986 to mitigate future COC impacts. Current soil and groundwater conditions are discussed in detail in the following sections.

3.2.1 Residual Soil Contamination

Soil removal actions, consisting of excavating and off-site disposal of contaminated soils and MGP residuals from the Unit 1 unsaturated zone, were completed on each of the four properties between 1991 and 2002, and soil remediation is considered complete. Although these excavations removed as much contaminant mass as was

deemed practical, COCs were left in Site soils (Tetra Tech 1992; URS Greiner Woodward-Clyde 1999; Geomatrix 2002a; Geomatrix 2002b).

Additional soil investigations were completed between 2008 and 2010 to further delineate the extent of remaining residual mass that may be an ongoing source of contaminants to groundwater and to support this evaluation of potential enhancements to the existing remedial strategy (ARCADIS 2009c; ARCADIS 2010b; ARCADIS 2010e). Based on the data, naphthalene is the most significant indicator of residual mass with the potential to represent an ongoing source of impacts to groundwater; naphthalene is found concurrent with, and in generally higher concentrations, than other soluble compounds (ARCADIS 2010b). A naphthalene concentration of 3,400 micrograms per kilogram (µg/kg) is the Environmental Screening Level (ESL) for deep soil (<3 meters) where groundwater is a current or potential source of drinking water for residential and commercial/industrial land use scenarios as defined in *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (SFBRWQCB May 2008). Consequently, soil investigations targeted the delineation of naphthalene concentrations greater than 3,400 µg/kg for screening soil that may provide an ongoing source to groundwater.

Cross sections in Figures 5 through 8 illustrate the vertical distribution of naphthalene and benzene beneath the PG&E parcel. COCs are primarily limited to the lower portion of the Unit 2 Aquitard and upper portion of the Unit 3 Aquifer. Residual contamination remains tied up in the finer soil of the uppermost saturated zone and extends into immediately underlying soils, typically extending to depths of between 25 and 40 feet bgs

As shown in Figures 9 and 12, residual mass that could be an ongoing source for groundwater impacts was found in three portions of the PG&E parcel: the west-central portion (noted as Area A), the central portion (noted as Area B), and the northeastern portion (noted as Area C) (ARCADIS 2009c; ARCADIS 2010b). Based on the data,, residual mass is confined within the boundaries of the PG&E parcel (ARCADIS 2010b). As currently identified, together these areas comprise an area of approximately 42,500 square feet. Additional details on each of the three areas are provided below.

Closest to the levee in the west-central area (Area A), the bottom of the naphthalene contamination has been defined at each sampling point; elevated naphthalene in soil was identified at a maximum depth of 38 feet bgs in PDI-29.

In Area B, elevated naphthalene concentrations extend to depths of between 16 and 30 feet bgs, although deeper soil data were not collected at the one location (PDI-20)

where elevated naphthalene concentrations were identified at 30 feet bgs; data from other locations within this area indicate it is unlikely that elevated naphthalene concentrations extend deeper than this. Sixteen soil borings were drilled to depths greater than 30 feet bgs in the vicinity of Area B.

In Area C, elevated concentrations of naphthalene were identified at 40 feet bgs (the maximum depth of investigation) at two locations. Data from other locations within this area indicate that elevated naphthalene concentrations do not extend deeper than this.

3.2.2 Groundwater Contamination

Dissolved phase COCs are primarily observed in two areas of the Site: in the central area of the PG&E parcel, and within the subsurface barrier located on the Caltrans/SMUD parcel (Figures 10 and 13). A sheet pile subsurface barrier installed to approximately 39 feet bgs was used to facilitate the soil excavation at the Caltrans/SMUD parcel and was left in place; this barrier now serves to contain and prevent the migration of dissolved-phase COCs at the Caltrans/SMUD parcel. Residual COC mass sorbed to soils in the saturated portions of Unit 2 and upper Unit 3 (i.e., from approximately 20 to 30 feet bgs), provides a source of dissolved COCs to groundwater. Dissolved phase COCs have primarily been detected in the upper Unit 3 Aquifer. BTEX and PAH plumes at the PG&E parcel follow the groundwater flow pattern away from the Sacramento River. The *2010 Annual Groundwater Monitoring Report* (ARCADIS 2011a) documents the latest validated set of groundwater data.

The central portion of the PG&E parcel has historically exhibited the highest concentrations of dissolved phase COCs. The northeastern and west-central portions of the parcel have typically shown dissolved COC concentrations an order of magnitude less than the central area, but have shown increased dissolved COC concentrations during periods of moderate to low groundwater levels (ARCADIS 2006). Decreases in the river stage likely decrease the groundwater gradients and increase the residence time allowing for additional COC mass to be dissolved into groundwater. Additionally, during periods of increased river stage (and increased groundwater flux) DO may be greater due to the influx of oxygenated water from the river. Seasonally higher DO may increase the rate of biodegradation and contribute to lower groundwater concentrations.

As the flow direction reestablishes in an easterly direction following the shutdown of the Ranney Collector and Front Street Well, the concentration and distribution of dissolved phase contaminants is expected to change. Based on groundwater modeling results, the groundwater plume will likely follow the potentiometric flow path direction to the

east and shrink in total length as groundwater velocities decrease. However, the reduction in groundwater velocity will increase the contact time for non aqueous phase liquid (NAPL) dissolution, potentially increasing groundwater concentrations in the source area (ARCADIS 2007a).

3.2.3 Soil Vapor Concentrations

A soil vapor probe installation and sampling event was conducted between August 31 and September 3, 2009 to establish current soil volatile organic compound (VOC) conditions (ARCADIS 2009e). Six shallow (approximately 5 feet bgs) and six deep (approximately 12 feet bgs) vapor probes were sampled to assess potential vapor intrusion exposures and risks to potential future workers or residents of onsite buildings. The soil vapor sampling locations were completed in areas of the Site with the highest concentrations of naphthalene and benzene in vadose zone and saturated soils, and the highest concentrations of benzene in groundwater.

Analytical results for VOCs in soil vapor found that PAHs were very infrequently detected, and when detected were at concentrations below health-based vapor intrusion screening levels. The screening levels used represent, for each compound, the lowest value of the California Human Health Screening Levels (OEHHA 2005), the ESLs (SFBRWQCB 2008), and a calculated value using the DTSC-modified *Johnson and Ettinger. Indoor Air Vapor Intrusion Model* (DTSC 2009a) soil gas screening model run using all standard default assumptions for a residential scenario. Naphthalene concentrations in soil vapor are illustrated in Figure 13. One or more BTEX compounds were detected in all soil vapor samples at both 5 feet bgs and 12 feet bgs (Figure 14). Detected concentrations of PAHs and BTEX generally corresponded with areas of the Site where higher concentrations of PAHs and BTEX had previously been detected in soil and/or groundwater samples. Of the six soil vapor sampling locations, BTEX compounds exceeded their respective screening levels at only one location (SV-3). The greatest exceedences were in a sample collected at 12 feet bgs (SV-3D) where the benzene concentration exceeded its screening level by a factor of more than 5,000.

These results suggest that the elevated concentrations of BTEX, but not PAHs, in soil vapor may pose a risk to future occupants of buildings onsite. However, as there are currently no buildings onsite that are used for continuous human occupancy, there is currently no risk to human health related to the vapor intrusion exposure pathway. These data provide a baseline representing current soil vapor conditions that may be compared with soil vapor data which will be collected following the implementation of this RAP.

3.2.4 Estimated Contaminant Reduction

Contaminant mass remaining at the Site was previously estimated at 5,900 pounds of BTEX and 67,000 pounds of PAHs (Geomatrix 2001). Based on GWETS operations between 1995 and 2009, approximately 209 pounds of BTEX and 846 pounds of PAHs have been removed from groundwater; total contaminant recovery as a percent of total contaminant mass has been very small (approximately 3.5 percent for BTEX and 1.3 percent for PAHs). If the rate of contaminant removal by the GWETS were assumed to be constant it would take 400 years to extract the BTEX compounds and over 1,050 years to reduce the PAHs.

Indicator parameters for intrinsic biodegradation have been collected at the Site (Geomatrix 2003). Analytical results indicate the following trends: (a) depletion of electron acceptors (DO, nitrate, and sulfate); (b) reducing conditions (negative oxidation-reduction potential [ORP] measurements); and (c) accumulation of metabolic byproducts or intermediates (dissolved Fe, dissolved Mn, and methane), also indicated by lower pH. These trends indicate that processes that promote the biodegradation of COCs in the saturated zone are occurring beneath the Site. These processes likely include aerobic respiration, iron reduction, manganese reduction, and methanogenesis.

Geomatrix estimated mass removal rates due to intrinsic biodegradation to be 170 to 450 pounds per year for BTEX and 3 to 90 pounds per year for PAHs, with actual biodegradation rates depending on the mass and the availability of COC molecules to microbes in the subsurface (Geomatrix 2001). Most Site wells have not shown significant decreases in dissolved COC concentrations over time. The lack of discernable concentration reduction trends in source area wells prevents direct measurement of residual mass reduction rates and indicates that the time period to achieve site-specific chemical cleanup levels is long (i.e., greater than 30 years; Geomatrix 2001).

A discussion of additional mass removal that may occur during the implementation of this RAP is included in Section 5.0.

3.2.5 Exposure Routes and Assessment

Exposure to contamination at the PG&E parcel remains a concern because of the presence of COCs in soil, groundwater, and soil vapor. Figure 15 is a CSM exposure flowchart that identifies sources of contamination and potential exposure routes. Sources of contamination are groundwater, soil, and soil vapor.

The entire PG&E parcel, with the exception of a relatively small portion in the northeast corner in the vicinity of the GWETS and in the vicinity of buried pipelines along the southern border of the parcel, is covered with a DTSC-approved engineered cap. Imported backfill or native soils are located immediately beneath the clay liner. This cap is maintained as part of the currently approved remedy for the PG&E parcel. As a result, there are no ingestion or direct contact exposure pathways to contaminants in soil. The presence of the cap also eliminates volatile emissions from groundwater or soils and particulate emissions from soils as potential exposure pathways for contaminants in soil and groundwater.

Human exposure to onsite groundwater or groundwater proximal to the Site is unlikely. Groundwater use at the Site is currently restricted by provisions of the existing LUCs. Any revisions to the LUCs should include provisions for preventing the extraction of groundwater for any reason other than the approved remedy. It should also be noted that the *Sacramento Docks Area Draft Specific Plan* (Wallace Roberts and Todd / Solomon E.T.C. 2008) indicates that future public water supply for the development will be provided by tying into an existing 12-inch water main along Front Street. Therefore ingestion or direct contact exposure pathways related to groundwater are considered incomplete under current and future conditions.

With the current remedy and administrative controls in place, there are no complete exposure pathways for utility/trench workers or Site trespassers. Following implementation of the remedy, additional assessment is necessary to determine if elevated concentrations of BTEX may pose a vapor inhalation risk to potential occupants of future onsite buildings. These could be adequately mitigated by using engineering controls such as vapor barriers during the construction of buildings associated with any redevelopment.

4. Remedial Action Objectives

RAOs are site-specific, clean-up objectives established for the protection of human health and the environment. The RAOs specify the standards and measurable, attainable, reasonable, time and area-based criteria to be achieved by the remedial action. Applicable or relevant and appropriate requirements (ARARs) and to be considered materials (TBCs) must be evaluated when developing RAOs for a site and selecting a remedial alternative.

4.1 Applicable or Relevant and Appropriate Requirements and To Be Considered Materials

ARARs are used as cleanup goals when they define an acceptable level of risk with respect to site-specific factors. For example, maximum contaminant levels (MCLs) under the Safe Drinking Water Act are normally acceptable levels of risk for specific contaminants in water. However, it maybe be necessary for cleanup goals for some substances (such a naphthalene in the case of this Site) to be based on non promulgated criteria and advisories either because ARARs do not exist for those substances or because an ARAR alone would not be sufficiently protective in the given circumstances (e.g., where additive effects from several chemicals are involved). In these situations, the cleanup requirements will be based on ARARs and TBCs. Similarly, State criteria, advisories, and guidance will also be considered for the State of California.

A summary of the ARARs and TBCs for the proposed groundwater remedy enhancement are included in Appendix D.

4.2 Chemical-Specific Cleanup Levels

Preliminary chemical-specific clean-up levels applicable to the Site for COCs in groundwater were initially presented in the *Feasibility Study for the Former Sacramento Manufactured Gas Plant Site* (Tetra Tech 1990) and the *Final Remedial Action Plan for the Former Sacramento Manufactured Gas Plant Site* (Tetra Tech 1991). These were later updated in the *Final Groundwater Engineering EE/C) and RAW* (Geomatrix 2001). The currently approved clean-up levels for COCs at this Site are as follows: MCLs for BTEX; a total of 19 micrograms per liter (µg/L) for the sum of non-carcinogenic PAHs; and 0.03 µg/L for the sum of carcinogenic PAHs. A comparison of the clean-up levels approved in 1990/1991 and 2001 is provided in Table 2.

Because it has been nearly 10 years since the cleanup levels were approved for this Site, they were reviewed so that updated values could be recommended, where appropriate based on currently promulgated ARARs and TBCs. A summary of the proposed cleanup levels, including recommended updates is discussed below and provided in Table 2 for comparison against the current and historic cleanup levels. Table 3 summarizes the source/rationale for the proposed revisions.

4.2.1 Ethylbenzene

When the currently approved cleanup levels were established, the MCL for ethylbenzene was 700 µg/L. As shown in Table 3, the current California MCL for ethylbenzene is 300 µg/L. A revised cleanup level for ethylbenzene of 300 µg/L is proposed.

4.2.2 Naphthalene

The currently approved cleanup levels considered naphthalene to be a non-carcinogenic PAH, however, naphthalene is now considered by the regulatory community as a possible human carcinogen. In response to this change in perspective, ARCADIS proposes the California Department of Public Health Notification Level (17 µg/L) as a revised cleanup level for naphthalene, which accounts for naphthalene as a potential carcinogen.

4.2.3 Carcinogenic PAHs

The currently approved cleanup level for total carcinogenic PAHs was based on Proposition 65 criteria (Tetra Tech 1991). ARCADIS proposes a revised cleanup level for total carcinogenic PAHs based on the current benzo(a)pyrene (B[a]P) MCL of 0.2 µg/L. The actual carcinogenic PAH concentrations in groundwater will be adjusted by the Office of Environmental Health Hazard Assessment (OEHHA) cancer potency factor prior to summation and comparison to the total carcinogenic PAH cleanup level (Table 3). This methodology for evaluating B(a)P equivalency is appropriate under current risk assessment guidance (OEHHA 2002).

Specifically, using groundwater concentrations detected in a single monitoring well during a single monitoring event, the actual concentration of benzo(a)anthracene will be multiplied by 0.1, the actual concentration of benzo(a)pyrene will be multiplied by 1, the actual concentration of benzo(b)fluoranthene will be multiplied by 0.1, the actual concentration of benzo(k)fluoranthene will be multiplied by 0.01, the actual concentration of chrysene will be multiplied by 0.001, and the actual concentration of

indeno(1,2,3-cd)pyrene will be multiplied by 0.1. The resulting values will then be added together, and if their sum is less than 0.2 µg/L, groundwater from the well will be considered to be below the cleanup level.

4.2.4 Non-Carcinogenic PAHs

The currently approved cleanup level for total non-carcinogenic PAHs was based on California Department of Health Services (DHS) applied action levels (AALs) (Tetra Tech 1991). ARCADIS proposes that a revised cleanup level for non-carcinogenic PAHs should be the lowest appropriate contaminant-specific screening level using current guidance from the San Francisco Bay Regional Water Quality Control Board (SFRWQCB 2008). Groundwater screening levels (Table F-1a in SFRWQCB 2008) are based on the lowest of a ceiling value, drinking water (toxicity) goal, indoor air impact goal, and an aquatic habitat goal.

To determine an appropriate site-specific cleanup level for total non-carcinogenic PAHs, ARCADIS proposes to evaluate each specific non-carcinogenic PAH COC (Table 3) against the lowest of the drinking water (toxicity) and indoor air impact goals. The aquatic habitat goal will not be considered as there is no discharge to surface water at the Site following the shutdown of the Ranney Collector in August 2009. The ceiling value will not be considered as it is not a health-based goal.

ARCADIS proposes the lowest contaminant-specific screening level of 43 µg/L will be utilized for the relevant total non-carcinogenic PAH cleanup level. Actual non-carcinogenic PAH concentrations in groundwater will be summed and compared to the total non-carcinogenic PAH cleanup level (Table 3). Specifically, actual concentrations of acenaphthene, acenaphthelyne, anthracene, benzo(g,h,i)perylene,fluoranthene, fluorene, phenanthrene, and pyrene detected in a single monitoring well during a single monitoring event will be summed together. If the resulting sum is less than 43 µg/L, groundwater from the well will be considered to be below the cleanup level.

4.3 Points of Compliance and Compliance Groundwater Monitoring Wells

As previously discussed, there are no ingestion or direct contact exposures to contaminants in soil, and ingestion or direct contact exposure pathways related to groundwater are considered incomplete under current and future conditions. Application of the cleanup levels within the interior of the Site is not warranted as long as the off-site, dissolved-phase plume is showing a continued reduction in size and concentrations are decreasing over time. With this in mind, the down-gradient site boundary is proposed as an appropriate point of compliance for the groundwater

cleanup levels to be applied. Compliance monitoring wells to measure the efficacy of the proposed enhancements to the current groundwater remedial action will be further discussed in the *Remedial Design / Remedial Action Implementation Plan* which will be completed following approval of this *RAP*.

4.4 Compliance Monitoring Plan

RAOs for the Site will have been met when each of the cleanup goals presented in Table 2 are met at the down-gradient site boundary (the point of compliance for the Site). A compliance monitoring plan which details sampling methodology, sampling frequency, evaluation criteria, and contingency actions will be included in the *Remedial Design / Remedial Action Implementation Plan* which will be completed following approval of this *RAP*.

5. Alternative Remedial Solutions and Recommended Alternative

The current approved remedy for groundwater remediation at the Site is based on the assumption that RAOs will be achieved by continued operation of the GWETS and SVETS, intrinsic biodegradation, and hydraulic containment via the Ranney Collector (Geomatrix 2001). Hydraulic conditions at the Site have changed following the shutdown of the Ranney Collector in 2009, necessitating a re-evaluation of the groundwater remedial strategy at the Site. Additionally, the current approved remedy does not include a time frame or strategy for shut down of the GWETS.

A review of alternative remedial solutions including continued operation of the GWETS, operation of an expanded GWETS, installation of a physical barrier, and *in-situ* soil stabilization / solidification (ISSS) is included in Appendix E. Based on this review, ISSS is the recommended remedial alternative for this Site.

As defined by the United States Environmental Protection Agency (USEPA), the ISSS technology relies on solidification and stabilization:

- Solidification refers to processes that encapsulate a waste to form a solid material with permeability much less than the surrounding soil and restrict contaminant migration by decreasing the surface area exposed to groundwater and thus leaching.

- Stabilization refers to processes that involve chemical reactions that reduce the leachability of a waste by chemically immobilizing the waste or reducing its aqueous solubility.

Of the solutions considered, ISSS would require the least amount of monitoring and maintenance to remain protective of human health and the environment and would be the most effective of the solutions considered in the long-term. Additionally, ISSS best meets EPA's preference for reduction of toxicity, mobility and volume through treatment although some increase in volume will occur as a result of ISSS treatment. Some minor reduction in contaminant mass will likely occur through the volatilization of chemicals during the mixing process. If vapors are emitted above levels established to protect nearby residents and visitors near the Site, they will be captured and treated. These levels will be established in the *Remedial Design / Remedial Action Implementation Plan* prepared by PG&E and submitted to DTSC following adoption of the final RAP.

ISSS will likely attain the cleanup levels within approximately 5 years and will therefore be effective in the short-term. ISSS will also be effective in the long term because it binds residual COCs in a solid matrix in perpetuity thereby reducing the mass transfer of COCs from the soil matrix to the groundwater.

A bench-scale treatability study was completed to develop an effective mix design to meet the treatability goals specified in the *Treatability Study – Revision 2 In Situ Soil Stabilization/Solidification* technical memorandum (ARCADIS 2009a). As shown by this study, a 10 percent Portland cement and four percent granular activated carbon design met the treatability goals (ARCADIS 2010c). At this time additional laboratory testing is being conducted to optimize the final design mix using the same procedures established in the treatability study work plan (ARCADIS 2011b).

Once the soil COC residual mass is treated, dissolved-phase COCs remaining in the groundwater would be captured by the GWETS until concentrations of COCs in monitoring wells are reduced to below the cleanup levels. Following the implementation of ISSS, concentrations in groundwater at the compliance point are projected to be reduced to below RAOs within 5 years. Extraction well capture zones are illustrated in Figures 16 and 17. Groundwater monitoring would continue until cleanup levels are reached and for some period thereafter. A LUC would be required as part of this solution.

It would not be necessary to maintain the GCL cap using this alternative. Once the COCs are stabilized, there is no longer any reason to control rain water infiltration into the subsurface. However, when the Site is re-graded following ISSS implementation, a clean soil / vegetated soil cap consisting of 3 feet of clean soil would be placed to minimize the possibility of direct human contact with the underlying soils. The LUC would be modified to require maintenance of the clean soil / vegetated cap or an asphalt cap.

6. Treatment Area for Remedial Action Implementation

The footprint of the proposed treatment area is included in Figure 16. Each proposed treatment area is split into 20 feet by 20 feet treatment cells. Each cell will be treated to the depths presented on Figure 18 and specified in Table 4. Treatment depths were selected as the first encountered depth where a naphthalene concentration of less than 3,400 µg/kg was measured.

A naphthalene concentration of 3,400 µg/kg is the ESL for deep soil (<3 meters) where groundwater is a current or potential source of drinking water for residential and commercial/industrial land use scenarios as defined in *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (SFBRWQCB May 2008). Consequently, soil where naphthalene concentrations are greater than 3,400 µg/kg has been included in the proposed treatment area. The proposed treatment area was also developed based on locations where concentrations of naphthalene in groundwater exceed 17 µg/L (the California Department of Public Health Notification level, and the proposed cleanup level for naphthalene in this RAP). At locations where the naphthalene concentration at the greatest depth investigated exceeded 3,400 µg/kg, the treatment depth was selected based on data from nearby cells. For consistency, and to minimize changes in treatment depth, treatment depths were extended below the first encountered depth where a naphthalene concentration of less than 3,400 µg/kg was measured in some instances.

Additional details on the implementation of ISSS will be included in the *Remedial Design / Remedial Action Implementation Plan* to be prepared by PG&E and submitted to DTSC following the adoption of the final *RAP*.

7. Schedule

Assuming that approval of the RAP is obtained in 2011, the field implementation of recommended remedy can be initiated at the start of the 2012 construction season in April or May 2012, depending on contractor availability and weather conditions. The total time required to implement this remedy is estimated to be 9 to 11 months comprised of the following components:

- Begin Preparation of the Remedial Design / Remedial Action Implementation Plan - 4 to 8 weeks after adoption of the Final RAP
- Permitting – 4 to 8 weeks
- Contractor Selection – 4 to 6 weeks
- Field Implementation – 5 to 6 months
- Report Preparation – 4 to 6 weeks

Completion of the ISSS will be followed by continued operation of the GWETS system and groundwater monitoring until the cleanup levels are achieved. Preliminary groundwater modeling has been completed (ARCADIS 2009b) to evaluate the behavior of the naphthalene and benzene plumes following implementation of the ISSS with the GWETS on. These analyses indicate that the modified GWETS will need to operate for up to 5 years following completion of the ISSS. After this 5-year period, concentrations of benzene and naphthalene are predicted to be less than the relevant cleanup levels of 1 µg/L and 17 µg/L, respectively, at the property boundary. Figures showing predicted benzene and naphthalene concentrations over the 5-year period following implementation of the ISSS are included in Appendix C. It may be noted that concentrations of naphthalene and benzene along the eastern property boundary are predicted to increase approximately one year after implementation of the ISSS during pumping from the GWETS. These concentrations are predicted to decrease to less than the cleanup levels within 5 years of the ISSS implementation.

8. Modification of the Land Use Covenant and Remedial Action Certification for the PG&E Parcel

Following the implementation of the ISSS alternative, maintenance of the GCL cap to limit surface water infiltration and decrease the potential for transport of COCs from affected soil to groundwater will no longer be necessary. The existing LUC for the PG&E parcel should be modified to include maintenance of a clean soil cover / vegetated cap or asphalt cap to minimize physical contact with the subsurface.

Groundwater use at the Site is currently restricted by provisions of the existing LUCs. Any revisions to the LUCs should include provisions for preventing the extraction of groundwater for any reason other than the approved remedy.

The current LUC prevents the PG&E parcel from being used for residential purposes and prevents exposure to the soil nearest the surface. Given that contamination will remain at the Site, this prohibition will remain. However, the LUC will be updated to reflect the implementation of ISSS and to include a map of the areas and depths of ISSS treatment. A draft revised LUC for the PG&E parcel is included in Appendix F.

It is estimated that PG&E will be in a position to request a remedial action certification for the PG&E parcel approximately 4 years after implementation of ISSS, toward the end of 2016.

9. References

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TABLE 1
SUMMARY OF REMEDIAL ACTIVITIES
Front and T Streets Sites
Sacramento, CA

Date	Parcel	Remedial Activity	Design Documentation	Action Documentation	Regulatory Documentation	Description
Aug-91 to Nov-91	PG&E	Soil Excavation	*Soil Remedial Action Design Plan (Addendum) for the Pacific Gas and Electric Sacramento Former Manufactured Gas Plant Site* . Tetra Tech, Inc. August 1991.	*Summary of Soil Remediation Activities at the Sacramento Former Manufactured Gas Plant Site.* Tetra Tech, Inc. June 1992.	*Approval of Soil Remedial Action Design Plan Pacific Gas and Electric Company.* DTSC. August 27, 1991.	Excavation and offsite disposal of approximately 46,000 cubic yards of soil from seven risk management zones. A buttress wall was constructed along the northwest portion of the property retaining wall to protect the levee. Soil was excavated to above the water table, with the maximum depth varying from approximately 14 to 21 ft bgs. Excavations were backfilled and compacted and the property was graded and paved with chip-sealed gravel as a temporary cap.
Aug-95 to present	PG&E	Cap Construction and Maintenance	*Groundwater Remedial Action Design Plan for the Sacramento Former Manufactured Gas Plant Site.* Tetra Tech, Inc. November 1992.	*Operation and Maintenance Manual for the PG&E Groundwater Extraction and Treatment System Located at 2000 Front Street, Sacramento, California* . EMCON. May 1996. *Cap Maintenance Plan* . ARCADIS. July 2007.	*PG&E - Sacramento, Former Manufactured Gas Plant Site - Installation of Engineered Cap and Groundwater Treatment System.* DTSC. January 18, 1996. *Well Maintenance Plan and Cap Operation and Maintenance Plan* . DTSC. August 10, 2007. *Operation and Maintenance Agreement.* DTSC. October 23, 2007.	A GCL was installed across most of the parcel to reduce surface water infiltration. A layer of aggregate base was compacted over the GCL and the entire parcel was paved with approximately 2 inches of asphaltic concrete.
Jul-95 to present	PG&E	GWETS Construction and Operation and Maintenance	*Technical Specifications: Ground-water Extraction and Treatment System.* EMCON. 1995. *Groundwater Extraction & Treatment System Relocation and Extraction Well Installation* . ARCADIS. June 2010.	*Operation and Maintenance Manual for the PG&E Groundwater Extraction and Treatment System Located at 2000 Front Street, Sacramento, California* . EMCON. May 1996. *Operation and Maintenance Manual.* ARCADIS. June 2010.	*PG&E - Sacramento, Former Manufactured Gas Plant Site - Installation of Engineered Cap and Groundwater Treatment System.* DTSC. January 18, 1996. *Operation and Maintenance Agreement.* DTSC. October 23, 2007	The GWETS was installed on the PG&E parcel in August 1995 and has operated nearly continuously since. Between 1995 and 2010, the system consisted of four extraction wells (EX-1 through EX-4), each extracting approximately 6 to 8 gallons per minute (gpm) of impacted groundwater. Two additional extraction wells (EX-5 and EX-6) were installed in December 2009 and connected with the system following relocation of the compound in June 2010. EX-5 and EX-6 are expected to provide complete capture of the plume while pumping at a rate of 12.5 gpm each. The groundwater is treated by two 10,000-pound (lb) granular activated carbon (GAC) vessels arranged in series and is discharged to the Sacramento Regional County Sanitation District (SRCSD) via above ground process piping to the City of Sacramento sanitary sewer. A total of approximately 151 million gallons of groundwater were extracted, treated, and discharged between August 1995 and December 2009. Approximately 209 pounds of BTEX and 846 pounds of PAHs have been removed from groundwater at the Site since 1995.
Jun-88	SHRA	Tank Removal	****	Untitled Tank Removal Letter Report. ERM West. July 6, 1988.	****	A gasoline UST was removed. Field observations and soil samples indicated the tank had leaked.
Dec-96	SHRA	Soil Excavation/ ORC Application	*Supplemental Site Investigation & Proposed Amendments to Remedial Action Plan, 1920 Front Street, Sacramento, California.* Harding Lawson Associates. September 1996.	****	****	Excavation and offsite disposal of approximately 200 cubic yards of gasoline-affected soil to a maximum depth of 25 ft bgs in the former UST area. The excavation was backfilled to approximately 11 ft bgs with a mixture of gravel and ORC.
Nov-01 and Dec-01	SHRA	Soil Excavation	*Soil Excavation Workplan, Pacific Gas & Electric Company, 1920 Front Street, Sacramento California* . Geomatrix. August 2001.	*Soil Excavation Report, 1920 Front Street, Sacramento, California.* Geomatrix. March 2002.	*Formal Approval of the Soil Excavation Work Plan, Pacific Gas &Electric Company, 1920 Front Street, Sacramento California, dated August 2001* . DTSC, October 15, 2001.	PG&E excavated and disposed offsite approximately 2,300 tons of soil contaminated with PAHs from and adjacent to risk management zone VIIIa. Concentrations in the confirmation soil samples met the soil cleanup goals. The excavation was backfilled and compacted with Class 2 aggregate base material.
Aug-02	SHRA	Soil Excavation	*Soil Excavation Workplan, Pacific Gas & Electric Company, 1920 Front Street, Sacramento California* . Geomatrix. August 2001.	*Additional Soil Excavation Report, 1920 Front Street, Sacramento, California.* Geomatrix. November 2002.	*Formal Approval of the Soil Excavation Work Plan, Pacific Gas &Electric Company, 1920 Front Street, Sacramento California, dated August 2001* . DTSC, October 15, 2001.	PG&E excavated and disposed offsite approximately 167 cubic yards of soil potentially containing elevated levels of PAHs from three areas, including a 10-foot wide strip along the base of the Sacramento River Levee and areas adjacent to MW-9 and MW-11. Concentrations in the excavation confirmation soil samples met the soil cleanup goals. The levee excavation was backfilled with sand-cement slurry, and the other excavations were backfilled and compacted with Class 2 aggregate base material.
Oct-98 to Mar-99	Caltrans/ SMUD	Soil Excavation	*Draft Final Removal Action Plan for Caltrans Right-of-Way and SMUD Property.* ERM-WEST, Inc. 1997.	*Excavation Closure Report, Caltrans and SMUD Front Street Site.* URS Greiner Woodward Clyde. April 1999.	****	Excavated 20,000 tons of affected soil. A sheet-pile wall (to approximately 39 ft bgs) was used to support an excavation completed to between 10 and 19 ft bgs. The base of the excavation was graded for placement of a GCL and 18 conductor casings were installed (extending from 10 ft below the base of the excavation to 30 ft above) for planned/future groundwater monitoring and vapor extraction . The GCL was placed at the base of the excavation (approximately 15 ft bgs) prior to backfilling with Class 3 permeable material to approximately 5 ft bgs. Filter fabric was placed over the Class 3 material to encapsulate it, and imported backfill was placed and compacted to final grade. The top of the sheet-pile wall was cut and left in place; the properties were landscaped, including installation of an irrigation system.
Dec-98 to Jan-07	Caltrans/ SMUD	SVETS Construction and Operation	*Draft Final Removal Action Plan for Caltrans Right-of-Way and SMUD Property.* ERM-WEST, Inc. 1997.	*Proposed Soil Vapor Extraction and Treatment System Decommissioning* . ARCADIS. October 2006. *Soil Vapor Extraction System Decommissioning Plan* . ARCADIS. April 2007.	*Proposed Soil Vapor Extraction and Treatment System Decommissioning* . DTSC. December 19, 2006. *Proposed Soil Vapor Extraction System Decommissioning Plan* . DTSC. May 16, 2007.	A SVETS was installed on the Caltrans parcel in 1999 to remediate impacted soil beneath the excavation and remove a potential source of COCs to groundwater. The SVETS consisted of 9 vapor extraction wells, 3 groundwater wells and a catalytic oxidizer to treat the extracted vapors. The system typically operated between late spring and early winter when groundwater levels were low. In October 2006, ARCADIS recommended permanent shutdown of the system due to low mass removal rates and a minimal effect on groundwater quality. The DTSC approved ARCADIS' request in a letter dated December 19, 2006, and the SVETS was shut down on January 2, 2007. All aboveground equipment, process piping, and electrical components were removed in July 2007. Removal of the vapor extraction wells and vaults will be completed in the future.
Apr-01	PG&E SHRA Caltrans SMUD	RAW	****	*Final Groundwater Engineering Evaluation / Cost Analysis (EE/CA) and Remedial Action Work Plan (RAW) Front & T Streets Site* . Geomatrix. April 2001.	Approval of EE/CA RAW. DTSC & RWQCB. April 27, 2001.	The approved remedy for groundwater remediation is intrinsic biodegradation of COCs through MNA along with continued operation of the groundwater and soil vapor extraction and treatment systems, maintenance of the cap on the PG&E parcel, hydraulic containment by production from the Ranney Collector, and land use covenants on each parcel. This strategy was approved by the DTSC and the RWQCB on April 27, 2001, and subsequently implemented at the Site.

Notes:
PG&E = Pacific Gas and Electric Company
SHRA = Sacramento Housing and Redevelopment Agency
SMUD = Sacramento Municipal Utility District
Caltrans = California Department of Transportation
GWETS = Groundwater Extraction and Treatment System
SVETS = Soil Vapor Extraction and Treatment System
RWQCB = California Regional Water Quality Control Board, Central Valley Region
DTSC = Department of Toxic Substances Control
**** = No information could be located by ARCADIS relative to this activity or document.

GCL = geosynthetic clay liner
RAW = Remedial Action Work Plan
COC = Constituents of concern
UST = underground storage tank
ft bgs = feet below ground surface
MNA = monitored natural attenuation
ORC = Oxygen Release Compound®
PAH = polycyclic aromatic hydrocarbons
BTEX = benzene, toluene, ethylbenzene, and xylenes

Table 2
Comparison of Previous and Currently Relevant Cleanup Levels
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

Constituent	Site-Specific Groundwater Cleanup Levels (µg/L) (Tetra Tech 1990; 1991)	Site-Specific Groundwater Cleanup Levels (µg/L) (Geomatrix 2001)	Currently Relevant Site-Specific Groundwater Cleanup Levels (µg/L)
Total Carcinogenic PAHs	0.03	0.03	0.2
Benzo(a)anthracene	--	--	--
Benzo(a)pyrene	--	--	--
Benzo(b)fluoranthene	--	--	--
Benzo(g,h,i)perylene*	--	*	*
Benzo(k)fluoranthene	--	--	--
Chrysene	--	--	--
Dibenz(a,h)anthracene**	--	**	**
Indeno(1,2,3-cd)pyrene	--	--	--
Total Non-Carcinogenic PAHs	19	19	43
Acenaphthene	--	--	--
Acenaphthylene	--	--	--
Anthracene	--	--	--
Benzo(g,h,i)perylene*	*	--	--
Fluoranthene	--	--	--
Fluorene	--	--	--
Naphthalene***	--	--	--
Phenanthrene	--	--	--
Pyrene	--	--	--
Naphthalene***	--	--	17
Arsenic	50	--	--
Lead	50	--	--
Cyanide	200	--	--
Copper	1,300	--	--
Zinc	5,000	--	--
Benzene	1	1	1
Ethylbenzene	680	700	300
Toluene	2,000	150	150
Xylene	1,750	1,750	1,750
Chlorobenzene	30	--	--

PAH = polycyclic aromatic hydrocarbon

µg/L = micrograms per liter

-- = analyte specific ARAR not listed

* = Benzo(g,h,i)perylene listed as a carcinogenic PAH in Tetra Tech (1990) and a non-carcinogenic PAH in Geomatrix (2001).

** = Dibenz(a,h)anthracene not included in Geomatrix 2001.

*** = Naphthalene currently proposed to have an analyte specific RAG

Tetra Tech 1990. *Feasibility Study for the Former Sacramento Manufactured Gas Plant Site* . December.

Tetra Tech 1991. *Final Remedial Action Plan for the Former Sacramento Manufactured Gas Plant Site* . May.

Geomatrix 2001. *Final Groundwater Engineering Evaluation/Cost Analysis (EECA) and Remedial Action Work Plan (RAW)* . April.

Table 3
Basis for Cleanup Levels
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

Compound	California MCL (µg/L)	OEHHA, CDPH Notification Level (µg/L)	Groundwater Screening Level (SFRWQCB 2008) (µg/L) (a)	Potency Factor (OEHHA 2002) (b)	Proposed Groundwater Cleanup Levels (µg/L)	Cleanup Level Basis
Carcinogenic PAHs						
Total cPAHs	--	--	--	--	0.2	Total cPAH cleanup level based on California MCL for benzo(a)pyrene; actual cPAH concentrations in groundwater will be adjusted by the OEHHA potency factor prior to summation and comparison to the total cPAH cleanup level.
Benzo(a)anthracene	--	--	0.029	0.1	--	--
Benzo(a)pyrene	0.2	--	0.2	1	--	--
Benzo(b)fluoranthene	--	--	0.029	0.1	--	--
Benzo(k)fluoranthene	--	--	0.029	0.01	--	--
Chrysene	--	--	4.8	0.001	--	--
Indeno(1,2,3-cd)pyrene	--	--	0.048	0.1	--	--
Non-Carcinogenic PAHs						
Total nPAHs	--	--	--	--	43	Total nPAH cleanup level based on minimum nPAH Groundwater Screening Level; actual nPAH concentrations in groundwater will be summed and compared to the total nPAH cleanup level.
Acenaphthene	--	--	420	--	--	--
Acenaphthylene	--	--	210	--	--	--
Anthracene	--	--	43	--	--	--
Benzo(g,h,i)perylene	--	--	210	--	--	--
Fluoranthene	--	--	280	--	--	--
Fluorene	--	--	280	--	--	--
Phenanthrene	--	--	210	--	--	--
Pyrene	--	--	140	--	--	--
Naphthalene						
Naphthalene	--	17	17	--	17	OEHHA, CDPH Notification Level; Groundwater Screening Level Current / Potential Drinking Water Resource
BTEX						
Benzene	1	--	1	--	1	California MCL
Toluene	150	--	150	--	150	California MCL
Ethylbenzene	300	--	300	--	300	California MCL
Xylenes (total)	1,750	--	1,800	--	1,750	California MCL

Notes:
µg/L = micrograms per liter
DTSC = Department of Toxic Substances Control
OEHHA = Office of Environmental Health Hazard Assessment
CDPH = California Department of Public Health
PAH = polycyclic aromatic hydrocarbon
cPAH = carcinogenic polycyclic aromatic hydrocarbon
nPAH = non-carcinogenic polycyclic aromatic hydrocarbon
MCL = maximum contaminant level
BTEX = benzene, toluene, ethylbenzene, and total xylenes
-- = analyte specific value not listed
(a) Values from Table F-1a (Groundwater Screening Levels - current or potential drinking water resource) in SFRWQCB 2008. Screening value based on lowest of Drinking Water (Toxicity) and Vapor Intrusion values. Aquatic Habitat screening levels not applicable at this site as there is no aquatic habitat receptor. Ceiling values not considered applicable as they are not health based.
(b) The concentrations of cPAHs detected in groundwater will be adjusted by the potency factor prior to summing for comparison to cPAH cleanup level.
SFRWQCB 2008. *Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater. Revised May.*
OEHHA 2002. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for describing Available Cancer Potency Factors.*

Table 4
In-Situ Soil Stabilization / Solidification Treatment Depths and Volumes
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

Cell ID	Cell Area (ft^2)	Depth of Stabilization (ft bgs)	Thickness of Stabilization Zone (ft^1)	Stabilization Volume (cubic yards)	Portland Cement Addition (tons)[2,3]	Granular Activated Carbon Addition (tons)[2,3]
Area A						
A-C205	400	35	23	341	42.8	17.1
A-C206	135	35	23	115	14.5	5.8
A-D203	400	40	28	415	52.1	20.9
A-D204	400	40	28	415	52.1	20.9
A-D205	400	35	23	341	42.8	17.1
A-D206	135	35	23	115	14.5	5.8
A-E203	400	40	28	415	52.1	20.9
A-E204	400	40	28	415	52.1	20.9
A-E205	400	35	23	341	42.8	17.1
A-E206	135	35	23	115	14.5	5.8
A-F203	400	40	28	415	52.1	20.9
A-F204	60	40	28	62	7.8	3.1
A-F205	60	35	23	51	6.4	2.6
A-F206	25	35	23	21	2.7	1.1
A-G203	200	40	28	207	26.1	10.4
Area B						
B-C3	400	30	18	267	33.5	13.4
B-C4	400	30	18	267	33.5	13.4
B-C5	400	30	18	267	33.5	13.4
B-C6	400	30	18	267	33.5	13.4
B-C9	400	30	18	267	33.5	13.4
B-C10	400	30	18	267	33.5	13.4
B-D3	400	30	18	267	33.5	13.4
B-D4	400	30	18	267	33.5	13.4
B-D5	400	30	18	267	33.5	13.4
B-D6	400	40	28	415	52.1	20.9
B-D7	400	40	28	415	52.1	20.9
B-D8	400	30	18	267	33.5	13.4
B-D9	400	30	18	267	33.5	13.4
B-E1	400	30	18	267	33.5	13.4
B-E2	400	30	18	267	33.5	13.4
B-E3	400	30	18	267	33.5	13.4
B-E4	400	30	18	267	33.5	13.4
B-E5	400	30	18	267	33.5	13.4
B-E6	400	40	28	415	52.1	20.9
B-E7	400	40	28	415	52.1	20.9
B-E8	400	30	18	267	33.5	13.4
B-E9	400	30	18	267	33.5	13.4
B-F1	400	30	18	267	33.5	13.4
B-F2	400	30	18	267	33.5	13.4
B-F3	400	30	18	267	33.5	13.4
B-F4	400	30	18	267	33.5	13.4
B-F5	400	30	18	267	33.5	13.4
B-F6	400	30	18	267	33.5	13.4
B-F7	400	30	18	267	33.5	13.4
B-F8	400	30	18	267	33.5	13.4
B-F9	400	30	18	267	33.5	13.4
B-G1	400	30	18	267	33.5	13.4

Table 4
In-Situ Soil Stabilization / Solidification Treatment Depths and Volumes
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

Cell ID	Cell Area (ft^2)	Depth of Stabilization (ft bgs)	Thickness of Stabilization Zone (ft^1)	Stabilization Volume (cubic yards)	Portland Cement Addition (tons)[2,3]	Granular Activated Carbon Addition (tons)[2,3]
B-G2	400	30	18	267	33.5	13.4
B-G3	400	30	18	267	33.5	13.4
B-G4	400	30	18	267	33.5	13.4
B-G5	400	30	18	267	33.5	13.4
B-G6	400	30	18	267	33.5	13.4
B-G7	180	30	18	120	15.1	6.0
B-H1	400	30	18	267	33.5	13.4
B-H2	400	30	18	267	33.5	13.4
B-H3	400	30	18	267	33.5	13.4
B-H4	400	30	18	267	33.5	13.4
B-H5	400	30	18	267	33.5	13.4
B-H6	400	30	18	267	33.5	13.4
B-H7	180	30	18	120	15.1	6.0
B-I1	400	30	18	267	33.5	13.4
B-I2	400	30	18	267	33.5	13.4
B-I3	400	30	18	267	33.5	13.4
B-I4	400	30	18	267	33.5	13.4
B-I5	400	30	18	267	33.5	13.4
B-I6	400	30	18	267	33.5	13.4
B-I7	180	30	18	120	15.1	6.0
B-J2	400	30	18	267	33.5	13.4
B-J3	400	30	18	267	33.5	13.4
B-K2	400	30	18	267	33.5	13.4
B-K3	400	30	18	267	33.5	13.4
B-L2	400	30	18	267	33.5	13.4
B-L3	400	30	18	267	33.5	13.4
B-M2	400	35	23	341	42.8	17.1
B-M3	400	35	23	341	42.8	17.1
B-N2	400	35	23	341	42.8	17.1
B-N3	400	35	23	341	42.8	17.1
B-O2	400	35	23	341	42.8	17.1
B-O3	400	35	23	341	42.8	17.1
Area C						
C-AA106	400	35	23	341	42.8	17.1
C-AA107	400	35	23	341	42.8	17.1
C-BB102	400	40	28	415	52.1	20.9
C-BB103	400	40	28	415	52.1	20.9
C-BB104	400	40	28	415	52.1	20.9
C-BB105	400	35	23	341	42.8	17.1
C-BB106	400	35	23	341	42.8	17.1
C-BB107	400	35	23	341	42.8	17.1
C-BB108	400	35	23	341	42.8	17.1
C-BB109	400	35	23	341	42.8	17.1
C-CC102	400	40	28	415	52.1	20.9
C-CC103	400	40	28	415	52.1	20.9
C-CC104	400	45	33	489	61.4	24.6
C-CC105	400	35	23	341	42.8	17.1
C-CC106	400	35	23	341	42.8	17.1
C-CC107	400	35	23	341	42.8	17.1

Table 4
In-Situ Soil Stabilization / Solidification Treatment Depths and Volumes
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

Cell ID	Cell Area (ft^2)	Depth of Stabilization (ft bgs)	Thickness of Stabilization Zone (ft^1)	Stabilization Volume (cubic yards)	Portland Cement Addition (tons)[2,3]	Granular Activated Carbon Addition (tons)[2,3]
C-CC108	400	35	23	341	42.8	17.1
C-CC109	400	35	23	341	42.8	17.1
C-DD102	400	35	23	341	42.8	17.1
C-DD103	400	35	23	341	42.8	17.1
C-DD104	400	35	23	341	42.8	17.1
C-DD105	400	35	23	341	42.8	17.1
C-DD106	400	35	23	341	42.8	17.1
C-DD107	400	35	23	341	42.8	17.1
C-DD108	400	35	23	341	42.8	17.1
C-DD109	400	35	23	341	42.8	17.1
C-EE103	400	25	13	193	24.2	9.7
C-EE104	400	30	18	267	33.5	13.4
C-EE105	400	30	18	267	33.5	13.4
C-EE106	400	30	18	267	33.5	13.4
C-EE107	400	40	28	415	52.1	20.9
C-EE108	400	45	33	489	61.4	24.6
C-EE109	400	40	28	415	52.1	20.9
C-FF103	186	25	13	90	11.3	4.5
C-FF104	364	25	13	175	22.0	8.8
C-FF105	400	25	13	193	24.2	9.7
C-FF106	400	30	18	267	33.5	13.4
C-FF107	400	40	28	415	52.1	20.9
C-FF108	400	40	28	415	52.1	20.9
C-FF109	280	40	28	290	36.5	14.6
C-GG104	35	25	13	17	2.1	0.8
C-GG105	200	25	13	96	12.1	4.8
C-GG106	371	30	18	247	31.1	12.4
C-GG107	400	35	23	341	42.8	17.1
C-GG108	390	35	23	332	41.8	16.7
C-GG109	120	35	23	102	12.8	5.1
C-HH106	24	30	18	16	2.0	0.8
C-HH107	200	35	23	170	21.4	8.6
C-HH108	205	35	23	175	21.9	8.8
Total	**46,465**			**36,477**	**4,585**	**1,834**

Notes:

1. Thickness of stabilization zone assumes the top 12 feet of soil is excavated prior to stabilization
2. Assumes the average dry bulk density of soil = 93 lbs/ft^3

   Reference: ARCADIS, 2010. *Revised Soil Solidification/Stabilization Treatability Study Report* . PG&E Front and T Street Site. Sacramento, California. May.
3. Mix design is 10% portland cement, 4% Granular Activated Carbon, by mass

ISSS = In situ soil stabilization / solidification

lbs = pounds

ft^3 = cubic feet

REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., SACRAMENTO EAST, CA, 1992, AND SACRAMENTO WEST, CA, 1992.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA

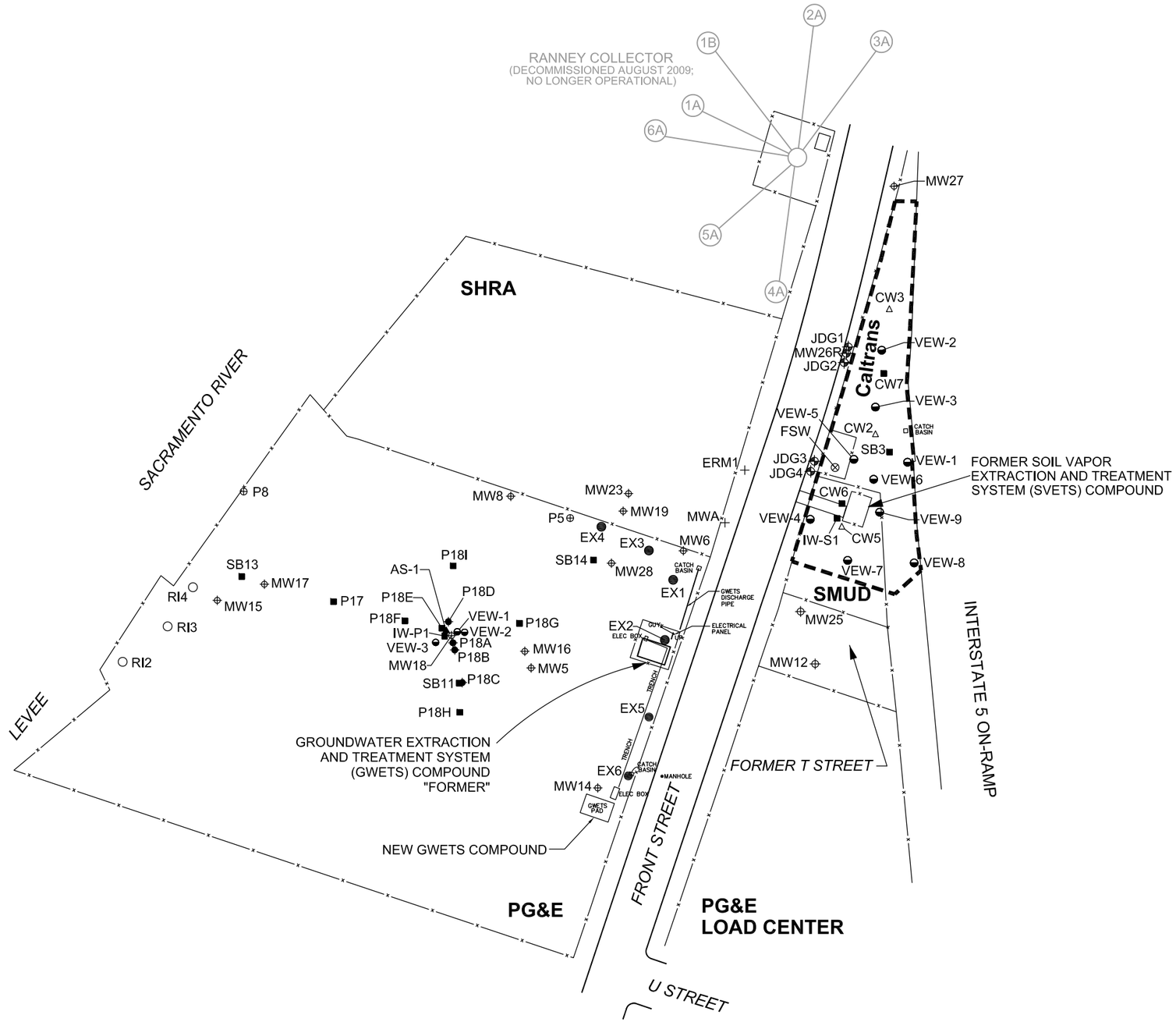
REMEDIAL ACTION PLAN

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
C:\Documents and Settings\jharris\Desktop\ENVCAD\RC000661.009\CF001\RAP\DWG\RC6619ICF1-B01.dwg LAYOUT: 1SAVED: 2/15/2010 12:17 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: SETUP1PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 6/8/2010 6:24 AM BY: HARRIS, JESSICA
XREFS: IMAGES: PROJECTNAME: ---
Sacramento_East_topo.tif
Sacramento_West_topo.tif



EXPLANATION

- JDG monitoring well
- PG&E monitoring well
- PG&E piezometer
- PG&E reinjection well
- PG&E extraction well
- Caltrans monitoring well
- SHRA monitoring well
- Front Street Well (FSW)
- Piezometer
- Air sparge well
- Vapor extraction well
- Design Study well
- Design Study soil boring
- Chain-link fence
- CALTRANS/SMUD Excavation and Shoring Boundary

NOTES:

1. Site boundaries, well, and soil boring locations based on November 2005 site survey by PLS.
2. Ranney Collector and Front Street Well (FSW) decommissioned August 2009.

ABBREVIATIONS:

PG&E = Pacific Gas and Electric Company
SHRA = Sacramento Housing and Redevelopment Agency
Caltrans = California Department of Transportation
SMUD = Sacramento Municipal Utility District
JDG = Front Street Joint Defense Group

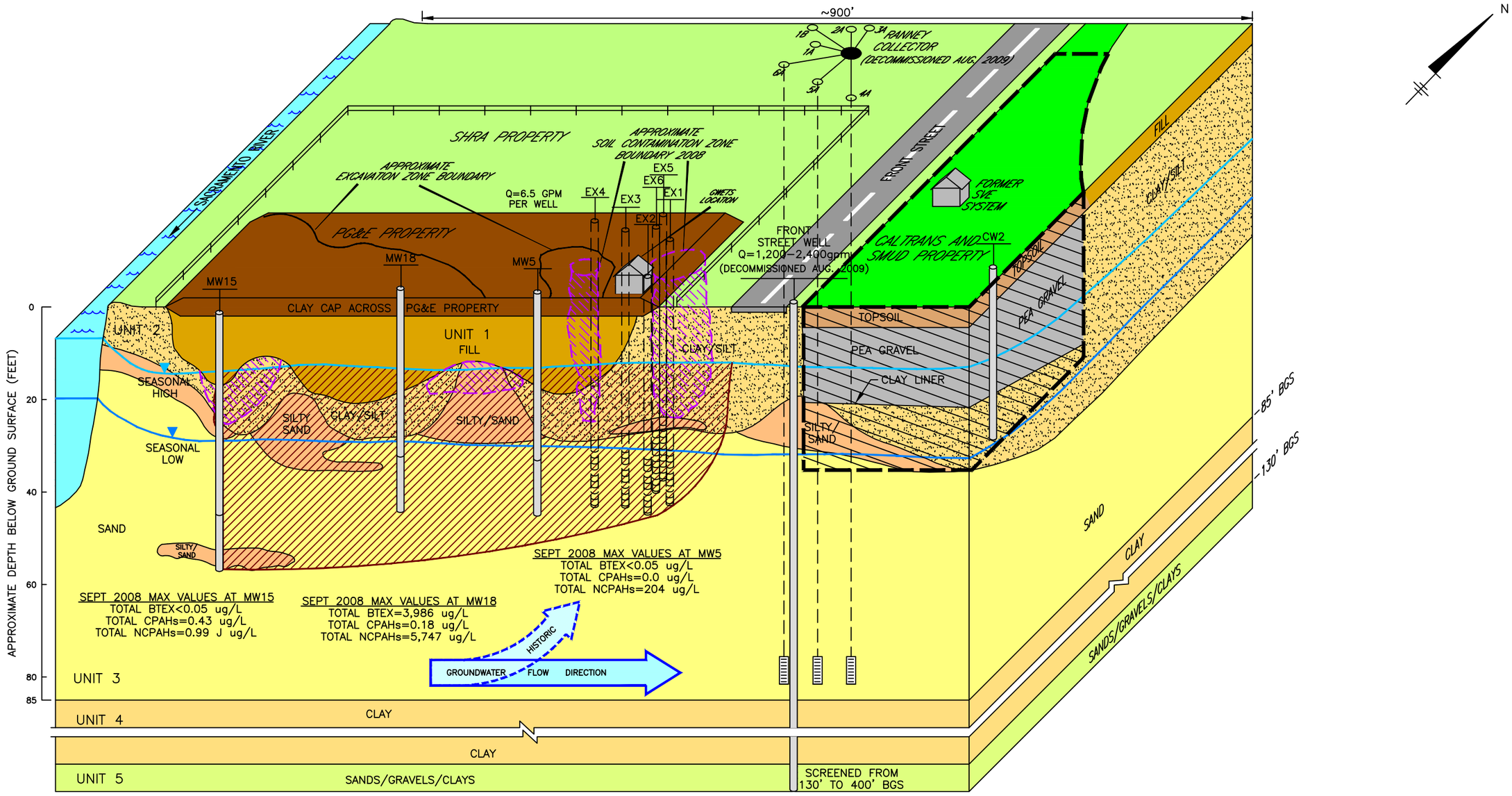
0 120' 240'
GRAPHIC SCALE

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

SITE LAYOUT

ARCADIS

FIGURE
2



LEGEND:

- GROUNDWATER CONTAMINATION (BTEX AND PAHs)
- SOIL CONTAMINATION (BTEX AND PAHs)
- SHORING WALL
- GROUNDWATER FLOW DIRECTION
- HISTORIC GROUNDWATER FLOW DIRECTION

NOTE:

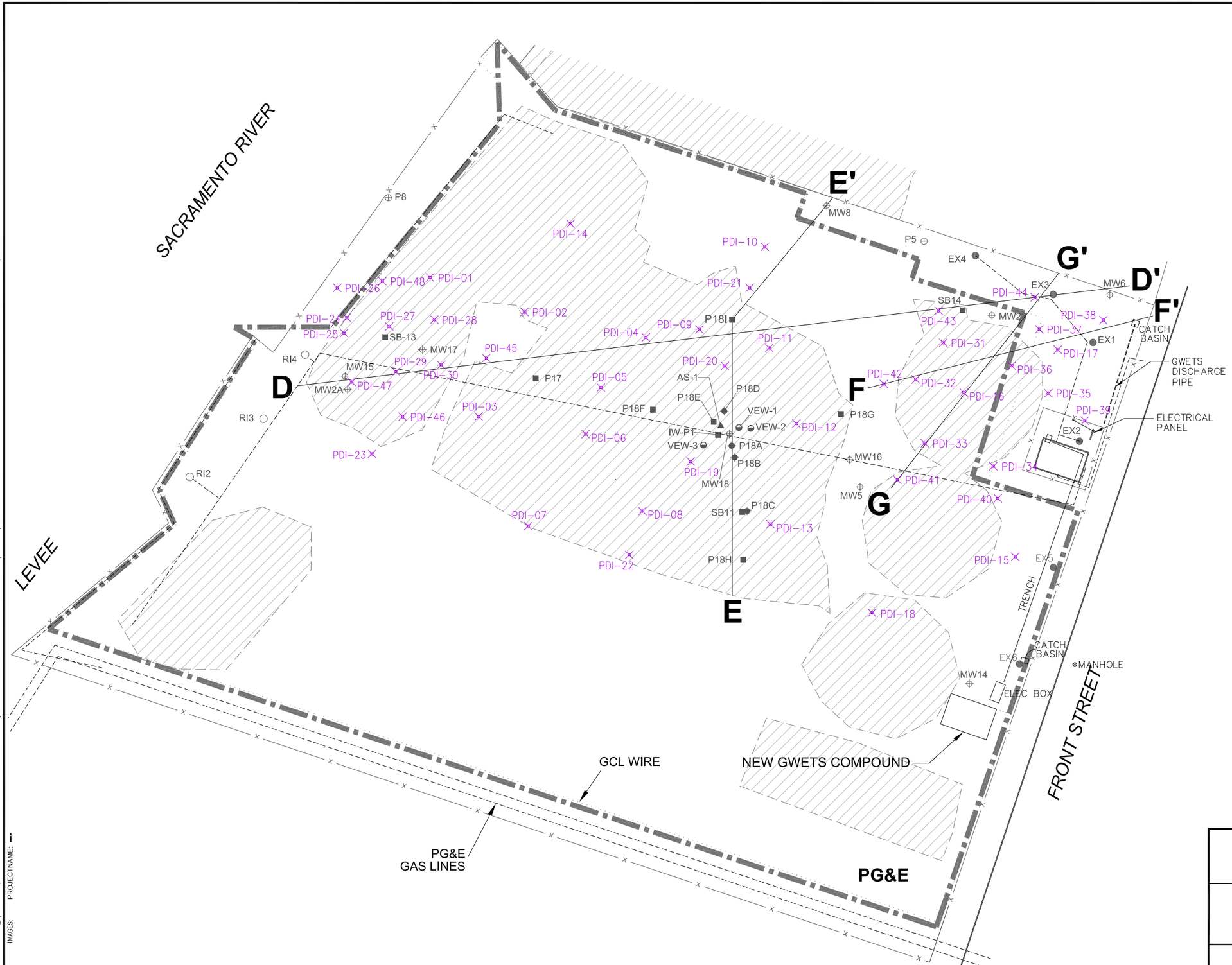
1. THIS DRAWING IS NOT TO SCALE. ALL DISTANCES ARE ESTIMATES TO USE AS A GENERAL GUIDE FOR THE SITE.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

CONCEPTUAL SITE MODEL

ARCADIS

FIGURE
3



EXPLANATION

- PG&E monitoring well
- PG&E piezometer
- PG&E reinjection well
- PG&E extraction well
- Piezometer
- Vapor extraction well (to be abandoned)
- Design Study well / soil boring
- Soil boring, 2008
- Chain-link fence
- Excavation
- Approximate limit of GCL
- Buried pipelines (locations approximate)
- D——D' Cross section

ABBREVIATIONS:

PG&E = Pacific Gas and Electric Company
GCL = Geosynthetic Clay Liner
bgs = below ground surface

0 60' 120'

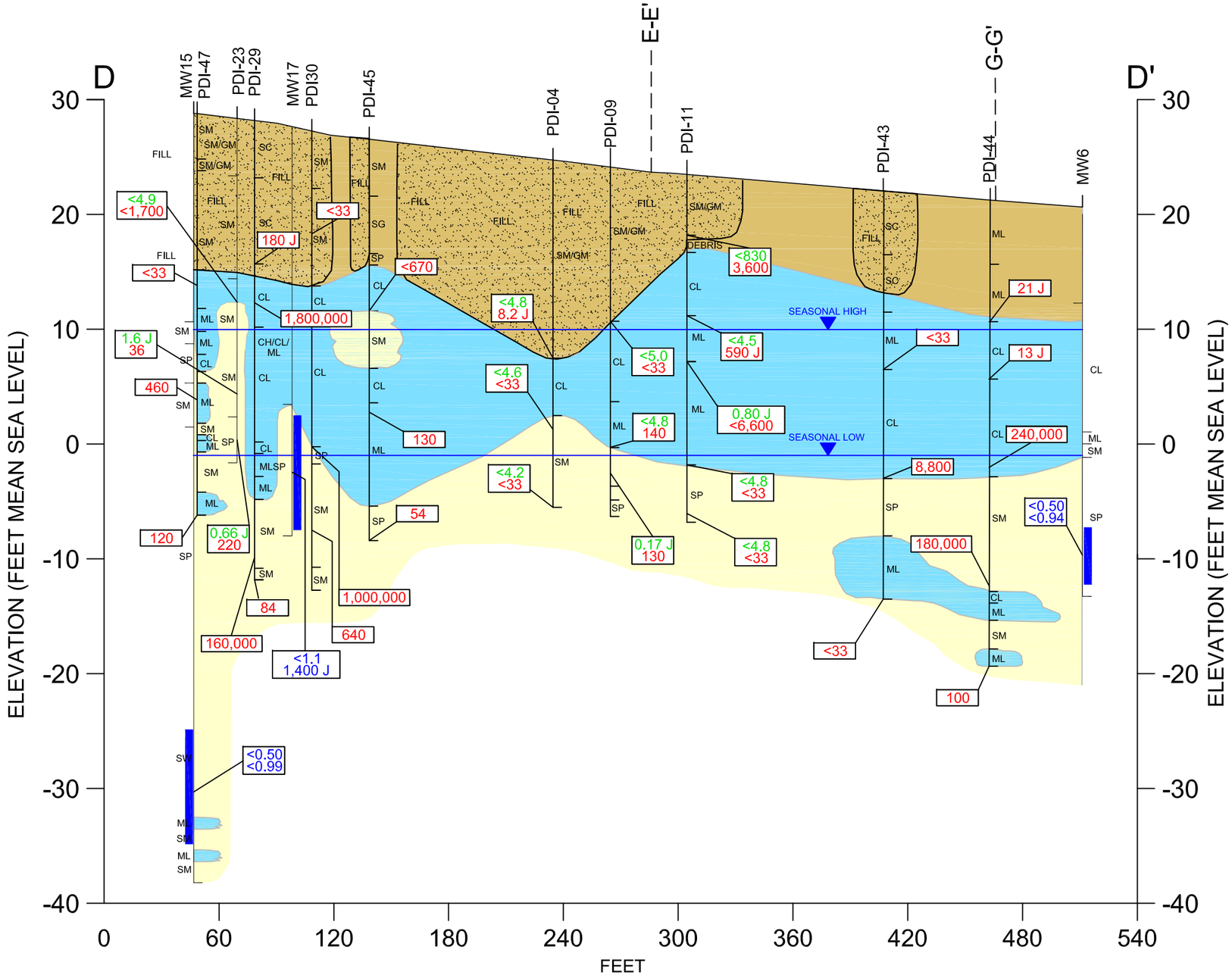
GRAPHIC SCALE

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

CROSS SECTION LOCATION MAP

ARCADIS

FIGURE
4



EXPLANATION

- UNIT 1 - FILL MATERIALS
- UNIT 2 - SILTS AND CLAYS (ML,CL,CH)
- UNIT 3 - SANDS (SP,SW,SC,SM)
- LITHOLOGIC CONTACTS
- POTENTIOMETRIC SURFACE
- WELL SCREEN
- ESTIMATED EXTENT OF EXCAVATION (GEOMATRIX 1991)
- (µg/Kg) MICROGRAMS PER KILOGRAM
- (µg/L) MICROGRAMS PER LITER
- J LABORATORY ESTIMATED VALUE
- <830 / 3,600 BENZENE IN SOIL (µg/Kg) (2008) NAPHTHALENE IN SOIL (µg/Kg) (2008)
- <830 / 3,600 BENZENE IN GROUNDWATER (µg/L) (SEPT. 2008) NAPHTHALENE IN GROUNDWATER (µg/L) (SEPT. 2008)

SCALE:
VERTICAL 1" = 10'
HORIZONTAL 1" = 60'

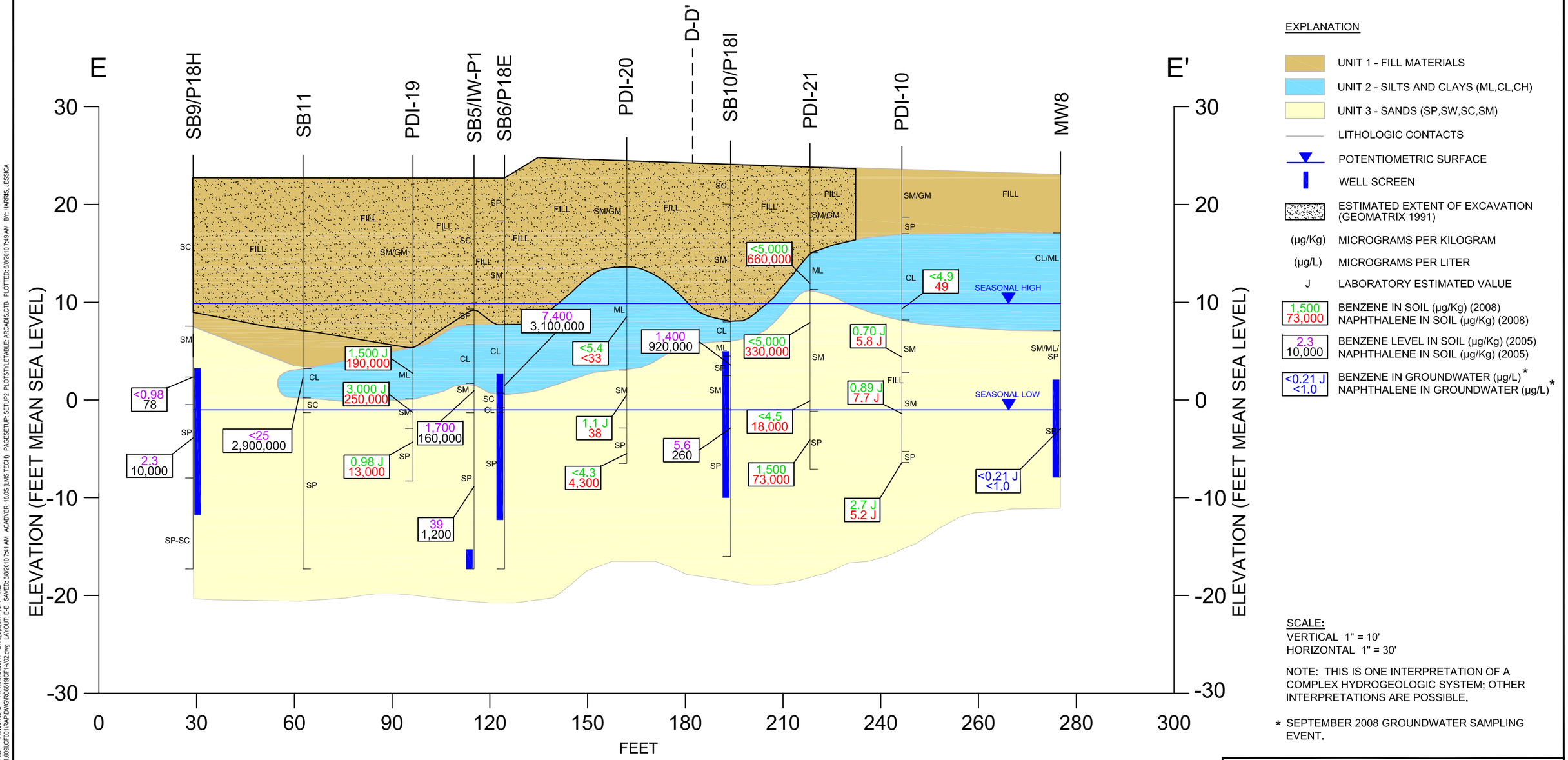
NOTE: THIS IS ONE INTERPRETATION OF A COMPLEX HYDROGEOLOGIC SYSTEM; OTHER INTERPRETATIONS ARE POSSIBLE.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

GEOLOGIC CROSS SECTION D-D'

ARCADIS

FIGURE
5



EXPLANATION

- UNIT 1 - FILL MATERIALS
- UNIT 2 - SILTS AND CLAYS (ML,CL,CH)
- UNIT 3 - SANDS (SP,SW,SC,SM)
- LITHOLOGIC CONTACTS
- POTENTIOMETRIC SURFACE
- WELL SCREEN
- ESTIMATED EXTENT OF EXCAVATION (GEOMATRIX 1991)
- (µg/Kg) MICROGRAMS PER KILOGRAM
- (µg/L) MICROGRAMS PER LITER
- J LABORATORY ESTIMATED VALUE
- 1,500 / 73,000 — BENZENE IN SOIL (µg/Kg) (2008) / NAPHTHALENE IN SOIL (µg/Kg) (2008)
- 2.3 / 10,000 — BENZENE LEVEL IN SOIL (µg/Kg) (2005) / NAPHTHALENE IN SOIL (µg/Kg) (2005)
- <0.21 J / <1.0 — BENZENE IN GROUNDWATER (µg/L)* / NAPHTHALENE IN GROUNDWATER (µg/L)*

SCALE:
VERTICAL 1" = 10'
HORIZONTAL 1" = 30'

NOTE: THIS IS ONE INTERPRETATION OF A COMPLEX HYDROGEOLOGIC SYSTEM; OTHER INTERPRETATIONS ARE POSSIBLE.

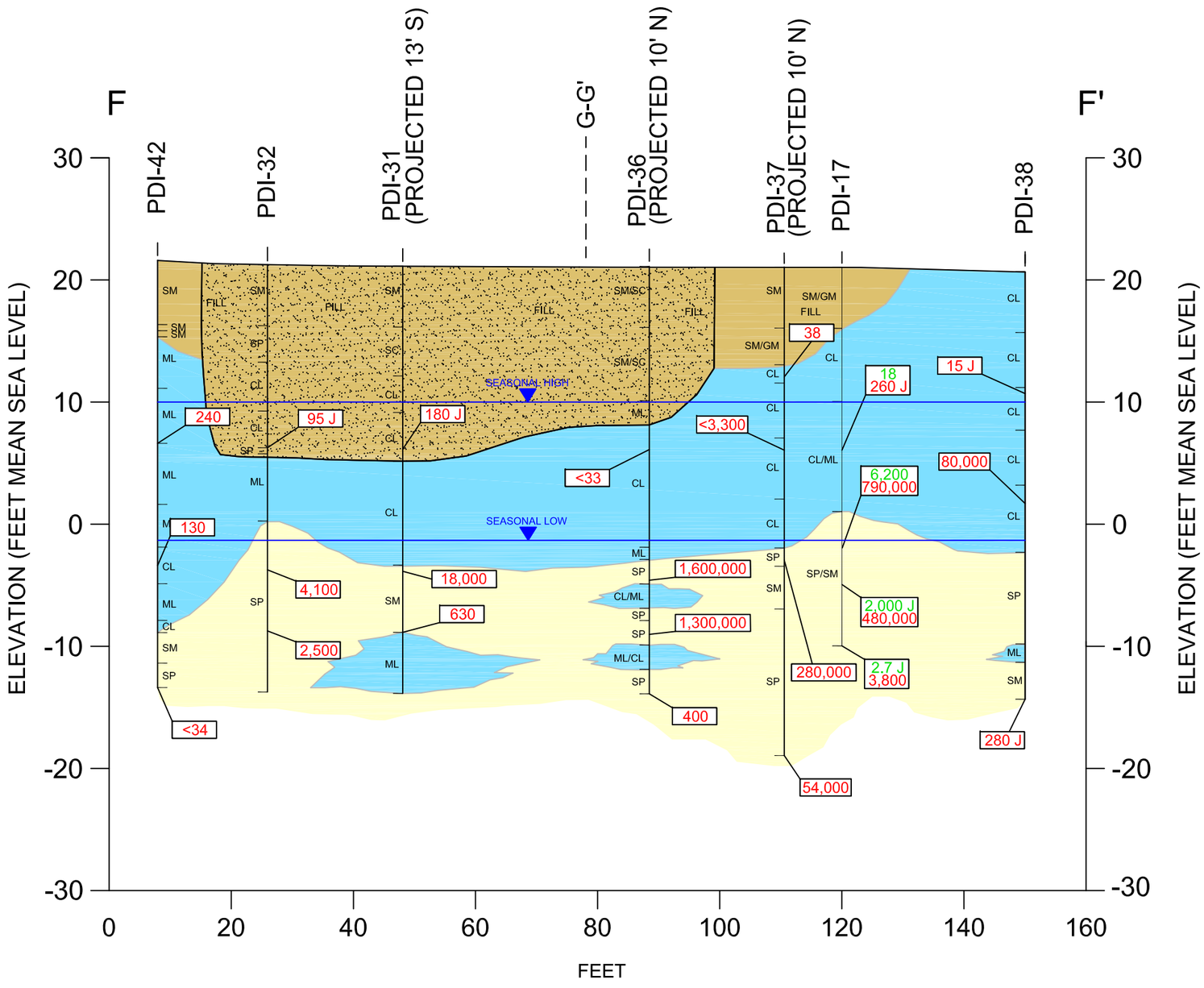
* SEPTEMBER 2008 GROUNDWATER SAMPLING EVENT.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

GEOLOGIC CROSS SECTION E-E'

ARCADIS

FIGURE
6



EXPLANATION

- UNIT 1 - FILL MATERIALS
- UNIT 2 - SILTS AND CLAYS (ML,CL,CH)
- UNIT 3 - SANDS (SP,SW,SC,SM)
- LITHOLOGIC CONTACTS
- POTENTIOMETRIC SURFACE
- ESTIMATED EXTENT OF EXCAVATION (GEOMATRIX 1991)
- (µg/Kg) MICROGRAMS PER KILOGRAM
- J LABORATORY ESTIMATED VALUE
- 6,200 / 790,000 BENZENE IN SOIL (µg/Kg) (2008) / NAPHTHALENE IN SOIL (µg/Kg) (2008)

SCALE:
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

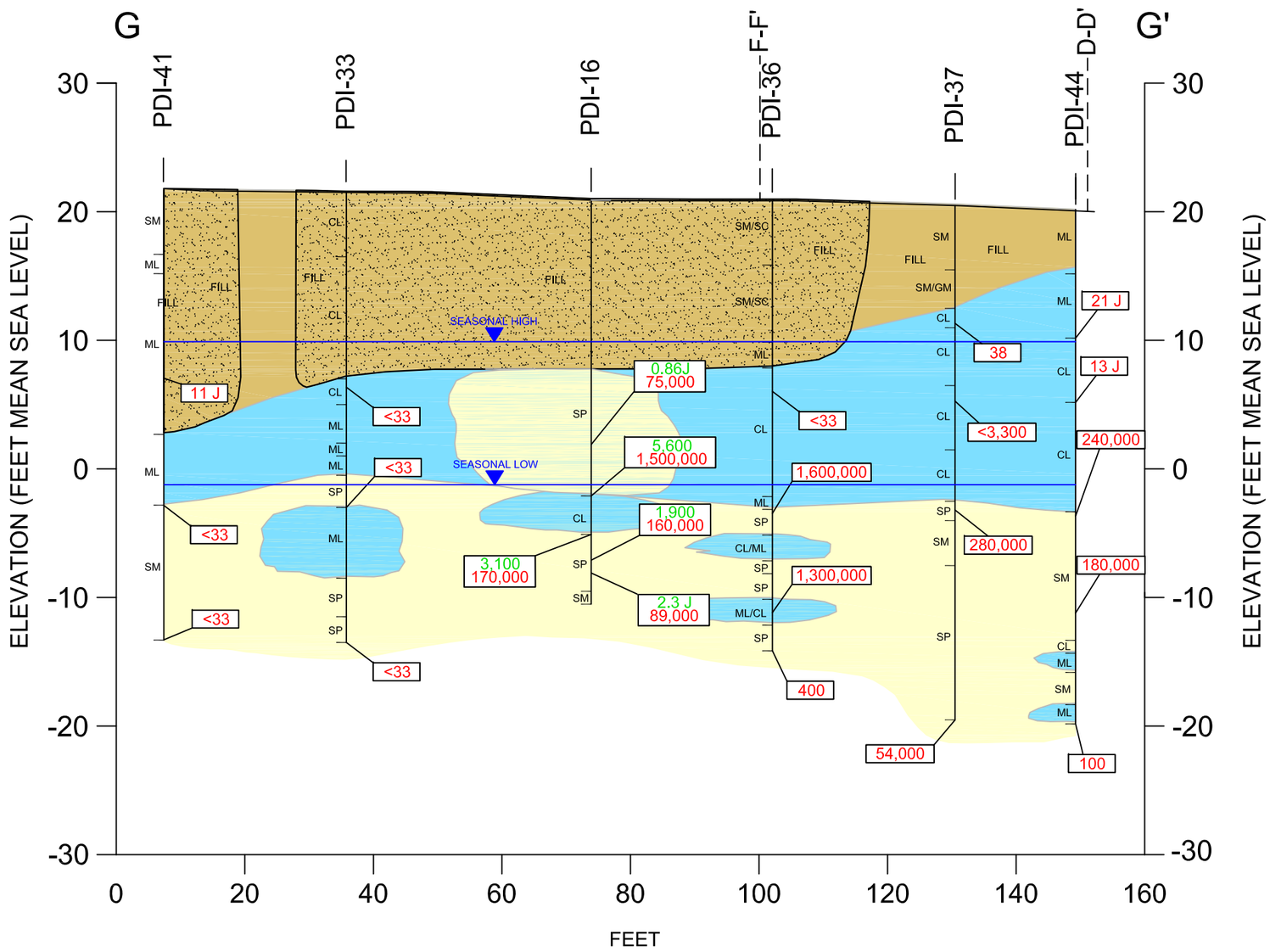
NOTE: THIS IS ONE INTERPRETATION OF A COMPLEX HYDROGEOLOGIC SYSTEM; OTHER INTERPRETATIONS ARE POSSIBLE.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

GEOLOGIC CROSS SECTION F-F'

ARCADIS

FIGURE
7



EXPLANATION

- UNIT 1 - FILL MATERIALS
- UNIT 2 - SILTS AND CLAYS (ML,CL,CH)
- UNIT 3 - SANDS (SP,SW,SC,SM)
- LITHOLOGIC CONTACTS
- POTENTIOMETRIC SURFACE
- ESTIMATED EXTENT OF EXCAVATION (GEOMATRIX 1991)
- (µg/Kg) MICROGRAMS PER KILOGRAM
- J LABORATORY ESTIMATED VALUE
- 1,500 / 73,000 BENZENE IN SOIL (µg/Kg) (2008) / NAPHTHALENE IN SOIL (µg/Kg) (2008)

SCALE:
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

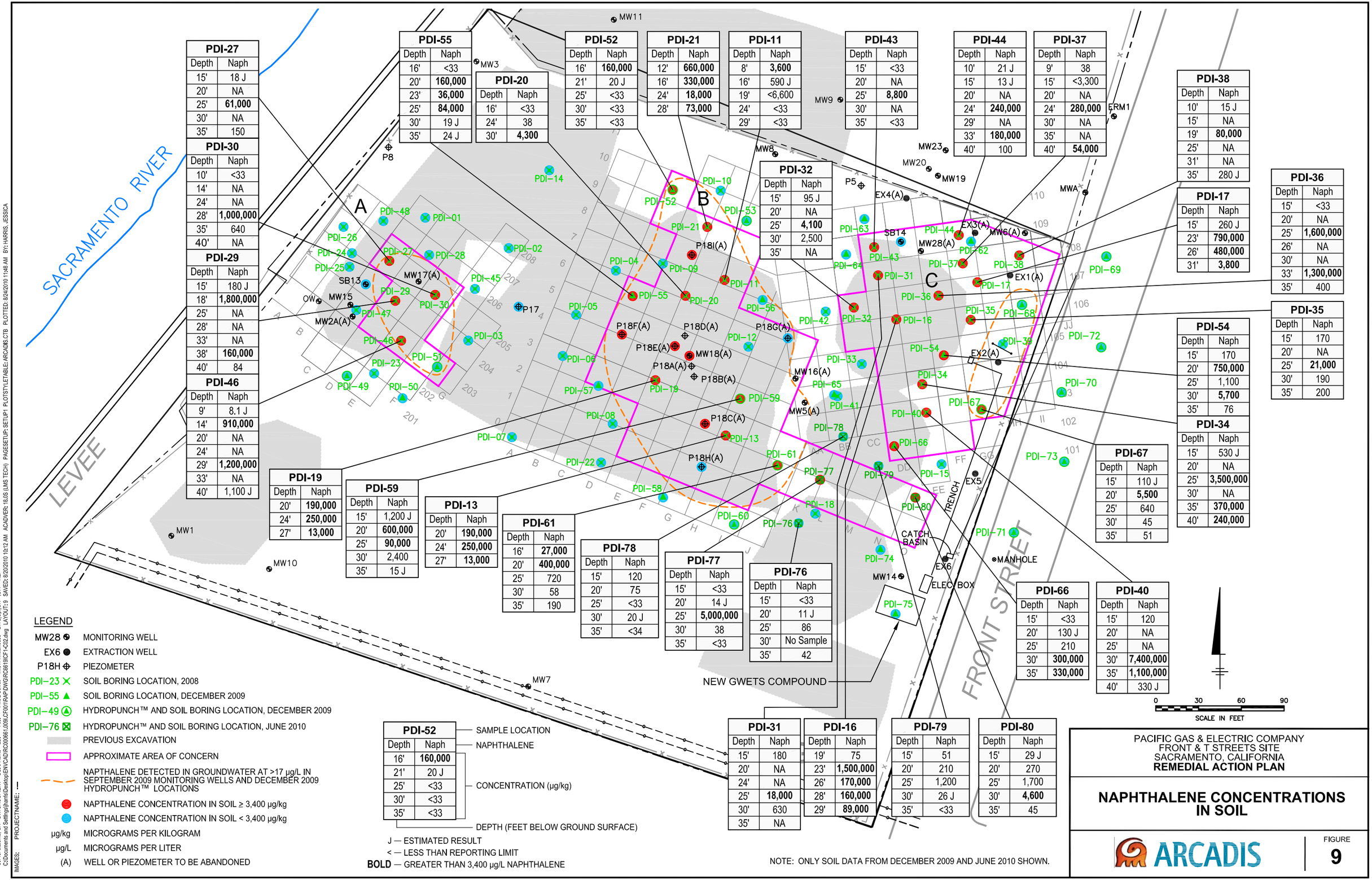
NOTE: THIS IS ONE INTERPRETATION OF A COMPLEX HYDROGEOLOGIC SYSTEM; OTHER INTERPRETATIONS ARE POSSIBLE.

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

GEOLOGIC CROSS SECTION G-G'

ARCADIS

FIGURE
8



PDI-27	
Depth	Naph
15'	18 J
20'	NA
25'	**61,000**
30'	NA
35'	150

PDI-30	
Depth	Naph
10'	<33
14'	NA
24'	NA
28'	**1,000,000**
35'	640
40'	NA

PDI-29	
Depth	Naph
15'	180 J
18'	**1,800,000**
25'	NA
28'	NA
33'	NA
38'	**160,000**
40'	84

PDI-46	
Depth	Naph
9'	8.1 J
14'	**910,000**
20'	NA
24'	NA
29'	**1,200,000**
33'	NA
40'	1,100 J

PDI-55	
Depth	Naph
16'	<33
20'	**160,000**
23'	**36,000**
25'	**84,000**
30'	19 J
35'	24 J

PDI-20	
Depth	Naph
16'	<33
24'	38
30'	**4,300**

PDI-52	
Depth	Naph
16'	**160,000**
21'	20 J
25'	<33
30'	<33
35'	<33

PDI-21	
Depth	Naph
12'	**660,000**
16'	**330,000**
24'	**18,000**
28'	**73,000**

PDI-11	
Depth	Naph
8'	**3,600**
16'	590 J
19'	<6,600
24'	<33
29'	<33

PDI-43	
Depth	Naph
15'	<33
20'	NA
25'	**8,800**
30'	NA
35'	<33

PDI-44	
Depth	Naph
10'	21 J
15'	13 J
20'	NA
24'	**240,000**
29'	NA
33'	**180,000**
40'	100

PDI-37	
Depth	Naph
9'	38
15'	<3,300
20'	NA
24'	**280,000**
30'	NA
35'	NA
40'	**54,000**

PDI-38	
Depth	Naph
10'	15 J
15'	NA
19'	**80,000**
25'	NA
31'	NA
35'	280 J

PDI-17	
Depth	Naph
15'	260 J
23'	**790,000**
26'	**480,000**
31'	**3,800**

PDI-36	
Depth	Naph
15'	<33
20'	NA
25'	**1,600,000**
26'	NA
30'	NA
33'	**1,300,000**
35'	400

PDI-35	
Depth	Naph
15'	170
20'	NA
25'	**21,000**
30'	190
35'	200

PDI-54	
Depth	Naph
15'	170
20'	**750,000**
25'	1,100
30'	**5,700**
35'	76

PDI-34	
Depth	Naph
15'	530 J
20'	NA
25'	**3,500,000**
30'	NA
35'	**370,000**
40'	**240,000**

PDI-67	
Depth	Naph
15'	110 J
20'	**5,500**
25'	640
30'	45
35'	51

PDI-66	
Depth	Naph
15'	<33
20'	130 J
25'	210
30'	**300,000**
35'	**330,000**

PDI-40	
Depth	Naph
15'	120
20'	NA
25'	NA
30'	**7,400,000**
35'	**1,100,000**
40'	330 J

PDI-32	
Depth	Naph
15'	95 J
20'	NA
25'	**4,100**
30'	2,500
35'	NA

PDI-19	
Depth	Naph
20'	**190,000**
24'	**250,000**
27'	**13,000**

PDI-59	
Depth	Naph
15'	1,200 J
20'	**600,000**
25'	**90,000**
30'	2,400
35'	15 J

PDI-13	
Depth	Naph
20'	**190,000**
24'	**250,000**
27'	**13,000**

PDI-61	
Depth	Naph
16'	**27,000**
20'	**400,000**
25'	720
30'	58
35'	190

PDI-78	
Depth	Naph
15'	120
20'	75
25'	<33
30'	20 J
35'	<34

PDI-77	
Depth	Naph
15'	<33
20'	14 J
25'	**5,000,000**
30'	38
35'	<33

PDI-76	
Depth	Naph
15'	<33
20'	11 J
25'	86
30'	No Sample
35'	42

PDI-31	
Depth	Naph
15'	180
20'	NA
24'	NA
25'	**18,000**
30'	630
35'	NA

PDI-16	
Depth	Naph
19'	75
23'	**1,500,000**
26'	**170,000**
28'	**160,000**
29'	**89,000**

PDI-79	
Depth	Naph
15'	51
20'	210
25'	1,200
30'	26 J
35'	<33

PDI-80	
Depth	Naph
15'	29 J
20'	270
25'	1,700
30'	**4,600**
35'	45

LEGEND

- MW28 — MONITORING WELL
- EX6 — EXTRACTION WELL
- P18H — PIEZOMETER
- PDI-23 — SOIL BORING LOCATION, 2008
- PDI-55 — SOIL BORING LOCATION, DECEMBER 2009
- PDI-49 — HYDROPUNCH™ AND SOIL BORING LOCATION, DECEMBER 2009
- PDI-76 — HYDROPUNCH™ AND SOIL BORING LOCATION, JUNE 2010
- PREVIOUS EXCAVATION
- APPROXIMATE AREA OF CONCERN
- NAPTHALENE DETECTED IN GROUNDWATER AT >17 µg/L IN SEPTEMBER 2009 MONITORING WELLS AND DECEMBER 2009 HYDROPUNCH™ LOCATIONS
- NAPTHALENE CONCENTRATION IN SOIL ≥ 3,400 µg/kg
- NAPTHALENE CONCENTRATION IN SOIL < 3,400 µg/kg
- µg/kg — MICROGRAMS PER KILOGRAM
- µg/L — MICROGRAMS PER LITER
- (A) — WELL OR PIEZOMETER TO BE ABANDONED

PDI-52	
Depth	Naph
16'	**160,000**
21'	20 J
25'	<33
30'	<33
35'	<33

SAMPLE LOCATION
NAPHTHALENE
CONCENTRATION (µg/kg)
DEPTH (FEET BELOW GROUND SURFACE)

J — ESTIMATED RESULT
< — LESS THAN REPORTING LIMIT
BOLD — GREATER THAN 3,400 µg/L NAPHTHALENE

NOTE: ONLY SOIL DATA FROM DECEMBER 2009 AND JUNE 2010 SHOWN.

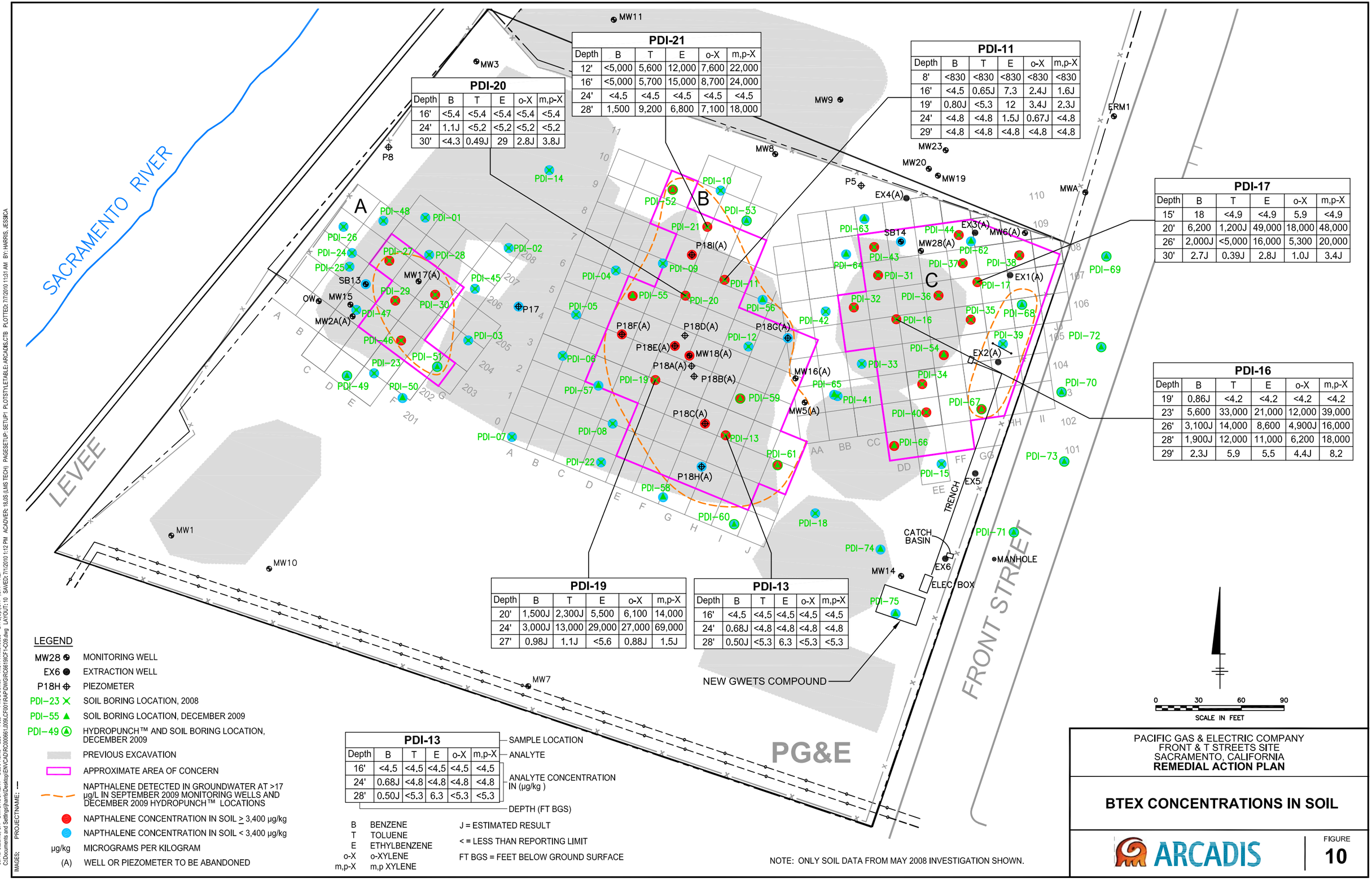
0 30 60 90
SCALE IN FEET

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

NAPHTHALENE CONCENTRATIONS IN SOIL

ARCADIS

FIGURE
9



PDI-21

Depth	B	T	E	o-X	m,p-X
12'	<5,000	5,600	12,000	7,600	22,000
16'	<5,000	5,700	15,000	8,700	24,000
24'	<4.5	<4.5	<4.5	<4.5	<4.5
28'	1,500	9,200	6,800	7,100	18,000

PDI-20

Depth	B	T	E	o-X	m,p-X
16'	<5.4	<5.4	<5.4	<5.4	<5.4
24'	1.1J	<5.2	<5.2	<5.2	<5.2
30'	<4.3	0.49J	29	2.8J	3.8J

PDI-11

Depth	B	T	E	o-X	m,p-X
8'	<830	<830	<830	<830	<830
16'	<4.5	0.65J	7.3	2.4J	1.6J
19'	0.80J	<5.3	12	3.4J	2.3J
24'	<4.8	<4.8	1.5J	0.67J	<4.8
29'	<4.8	<4.8	<4.8	<4.8	<4.8

PDI-17

Depth	B	T	E	o-X	m,p-X
15'	18	<4.9	<4.9	5.9	<4.9
20'	6,200	1,200J	49,000	18,000	48,000
26'	2,000J	<5,000	16,000	5,300	20,000
30'	2.7J	0.39J	2.8J	1.0J	3.4J

PDI-16

Depth	B	T	E	o-X	m,p-X
19'	0.86J	<4.2	<4.2	<4.2	<4.2
23'	5,600	33,000	21,000	12,000	39,000
26'	3,100J	14,000	8,600	4,900J	16,000
28'	1,900J	12,000	11,000	6,200	18,000
29'	2.3J	5.9	5.5	4.4J	8.2

PDI-19

Depth	B	T	E	o-X	m,p-X
20'	1,500J	2,300J	5,500	6,100	14,000
24'	3,000J	13,000	29,000	27,000	69,000
27'	0.98J	1.1J	<5.6	0.88J	1.5J

PDI-13

Depth	B	T	E	o-X	m,p-X
16'	<4.5	<4.5	<4.5	<4.5	<4.5
24'	0.68J	<4.8	<4.8	<4.8	<4.8
28'	0.50J	<5.3	6.3	<5.3	<5.3

PDI-13

Depth	B	T	E	o-X	m,p-X
16'	<4.5	<4.5	<4.5	<4.5	<4.5
24'	0.68J	<4.8	<4.8	<4.8	<4.8
28'	0.50J	<5.3	6.3	<5.3	<5.3

SAMPLE LOCATION
ANALYTE
ANALYTE CONCENTRATION IN (µg/kg)
DEPTH (FT BGS)

LEGEND

- MW28 ⊕ MONITORING WELL
- EX6 ● EXTRACTION WELL
- P18H ⊕ PIEZOMETER
- PDI-23 ✕ SOIL BORING LOCATION, 2008
- PDI-55 ▲ SOIL BORING LOCATION, DECEMBER 2009
- PDI-49 Ⓐ HYDROPUNCH™ AND SOIL BORING LOCATION, DECEMBER 2009
- PREVIOUS EXCAVATION
- APPROXIMATE AREA OF CONCERN
- NAPTHALENE DETECTED IN GROUNDWATER AT >17 µg/L IN SEPTEMBER 2009 MONITORING WELLS AND DECEMBER 2009 HYDROPUNCH™ LOCATIONS
- NAPTHALENE CONCENTRATION IN SOIL ≥ 3,400 µg/kg
- NAPTHALENE CONCENTRATION IN SOIL < 3,400 µg/kg
- µg/kg MICROGRAMS PER KILOGRAM
- (A) WELL OR PIEZOMETER TO BE ABANDONED

B BENZENE
T TOLUENE
E ETHYLBENZENE
o-X o-XYLENE
m,p-X m,p XYLENE

J = ESTIMATED RESULT
< = LESS THAN REPORTING LIMIT
FT BGS = FEET BELOW GROUND SURFACE

NOTE: ONLY SOIL DATA FROM MAY 2008 INVESTIGATION SHOWN.

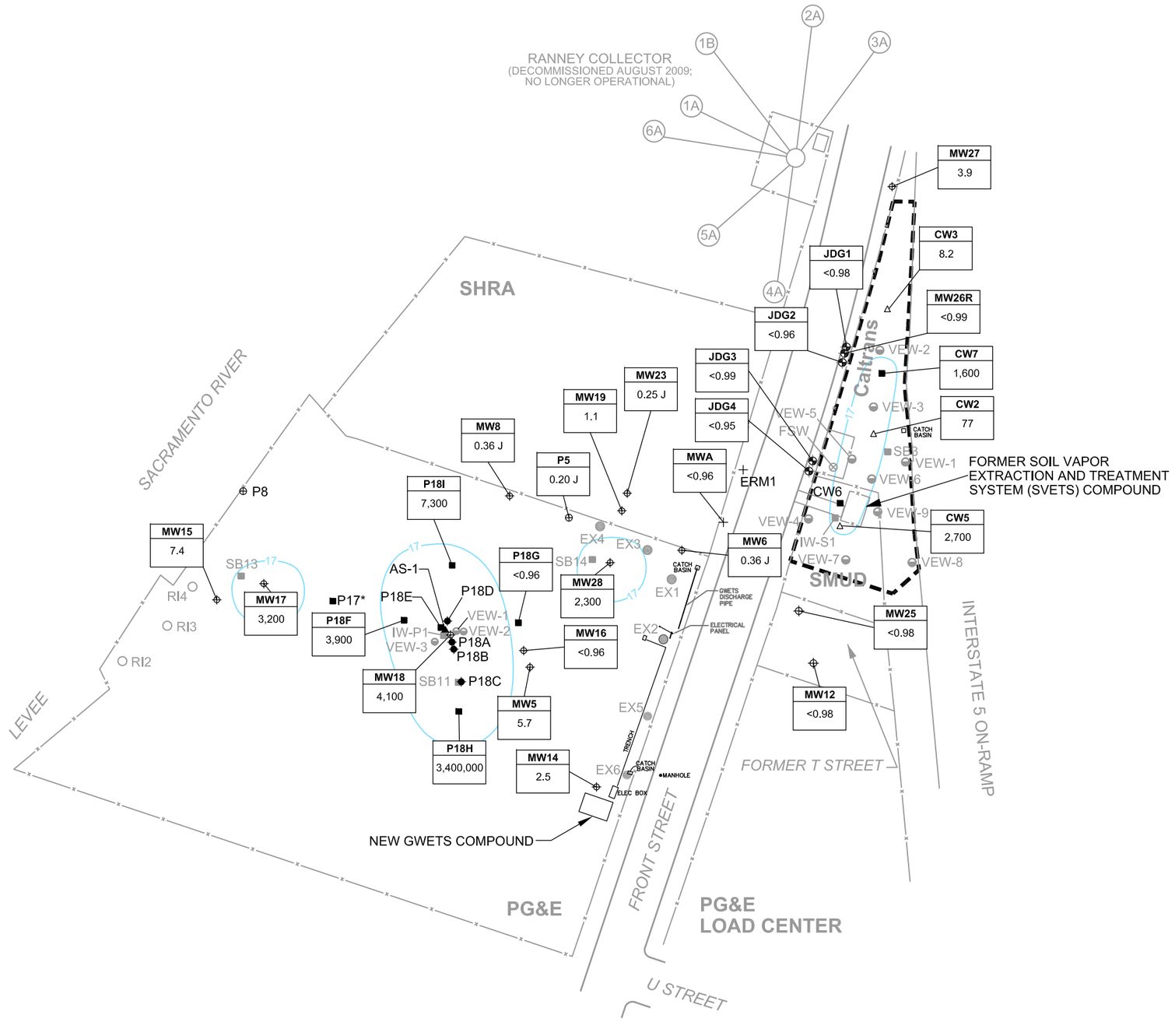
0 30 60 90
SCALE IN FEET

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

BTEX CONCENTRATIONS IN SOIL

ARCADIS

FIGURE
10



EXPLANATION

- JDG monitoring well
- PG&E monitoring well
- PG&E piezometer
- PG&E reinjection well
- PG&E extraction well
- Caltrans monitoring well
- SHRA monitoring well
- Front Street Well (FSW)
- Piezometer
- Air sparge well
- Vapor extraction well
- Design Study well
- Design Study soil boring
- Chain-link fence
- CALTRANS/SMUD Excavation and Shoring Boundary
- Inferred limits of Naphthalene exceeding its proposed Cleanup Level

CW2
77

Well/Sample ID
Naphthalene concentration reported in micrograms per Liter (µg/L)

* P17 was last analyzed in 2007 and contained a naphthalene concentration of 6.1 µg/L

NOTES:

1. Site boundaries, well, and soil boring locations based on November 2005 site survey by PLS.
2. Ranney Collector and Front Street Well (FSW) decommissioned August 2009.
3. J = Estimated Result
4. Samples collected in March 2010
5. Proposed Cleanup Level:
   -Naphthalene = 17 µg/L

ABBREVIATIONS:

PG&E = Pacific Gas and Electric Company
SHRA = Sacramento Housing and Redevelopment Agency
Caltrans = California Department of Transportation
SMUD = Sacramento Municipal Utility District
JDG = Front Street Joint Defense Group

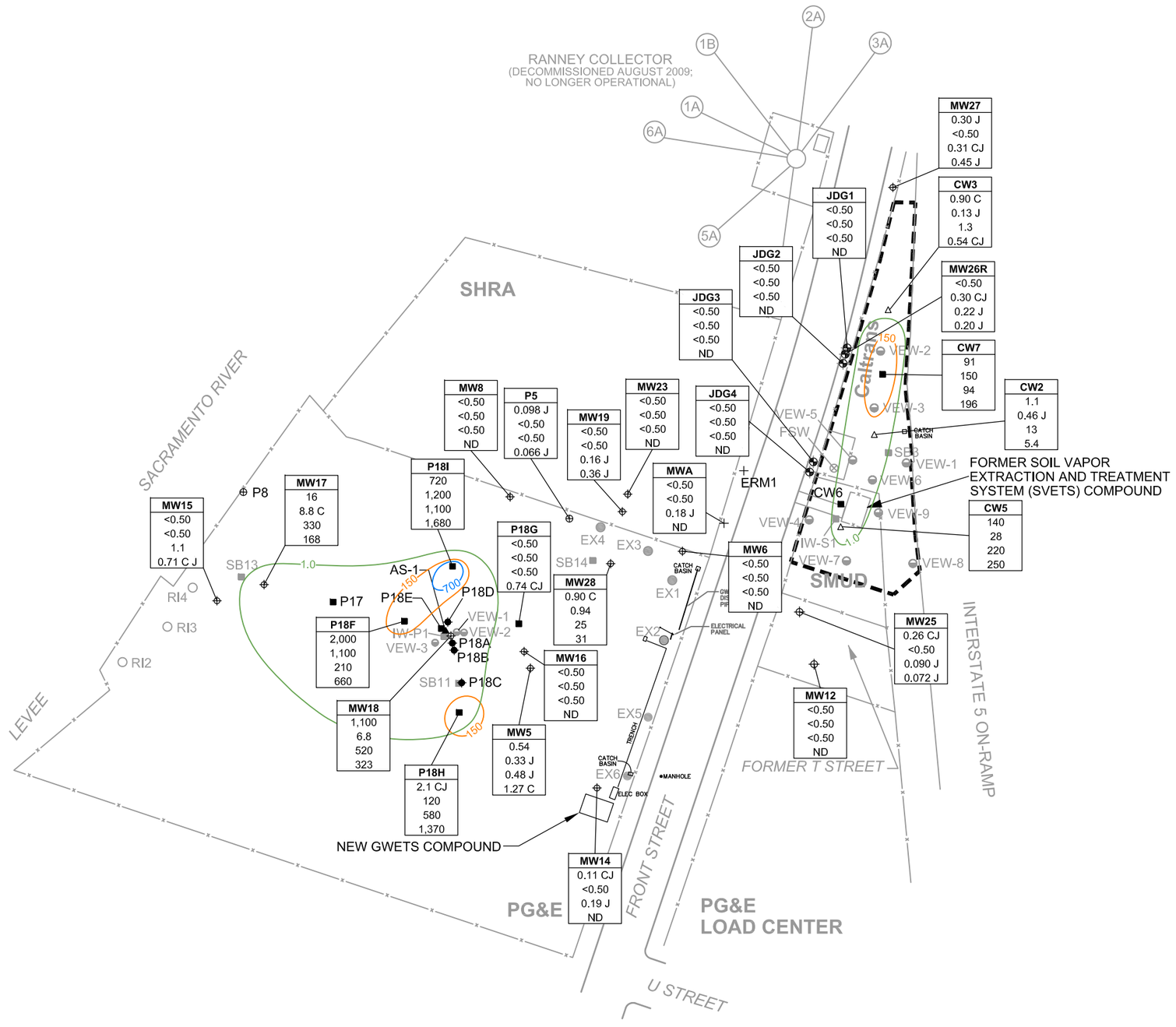
0 120' 240'
GRAPHIC SCALE

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

NAPHTHALENE CONCENTRATIONS IN GROUNDWATER MARCH 2010

ARCADIS

FIGURE
11



EXPLANATION

- JDG monitoring well
- PG&E monitoring well
- PG&E piezometer
- PG&E reinjection well
- PG&E extraction well
- Caltrans monitoring well
- SHRA monitoring well
- Front Street Well (FSW)
- Piezometer
- Air sparge well
- Vapor extraction well
- Design Study well
- Design Study soil boring
- Chain-link fence
- CALTRANS/SMUD Excavation and Shoring Boundary
- Inferred limits of Benzene exceeding its Cleanup Level
- Inferred limits of Toluene exceeding its Cleanup Level
- Inferred limits of Ethylbenzene exceeding its Cleanup Level

CW2	Well/Sample ID
1.1	Benzene
0.46 J	Toluene
13	Ethylbenzene
5.4	Xylene

Concentrations are in micrograms per Liter (µg/L)

NOTES:

1. Site boundaries, well, and soil boring locations based on November 2005 site survey by PLS.
2. Ranney Collector and Front Street Well (FSW) decommissioned August 2009.
3. ND = Not Detected
4. J = Estimated Result
5. C = Presence confirmed, but RPD between columns exceeds 40%
6. Samples collected in March 2010.
7. Cleanup Levels:
   -Benzene = 1.0 µg/L -Toluene = 150 µg/L
   -Ethylbenzene = 700 µg/L -Xylene = 1,750 µg/L

ABBREVIATIONS:

PG&E = Pacific Gas and Electric Company
SHRA = Sacramento Housing and Redevelopment Agency
Caltrans = California Department of Transportation
SMUD = Sacramento Municipal Utility District
JDG = Front Street Joint Defense Group

0 120' 240'
GRAPHIC SCALE

PACIFIC GAS AND ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

BTEX CONCENTRATIONS IN GROUNDWATER MARCH 2010

ARCADIS

FIGURE
12

SV	Naphthalene
1S	<0.0011
1D	<0.0011

SV	Naphthalene
2S	<0.0011
2D	<0.0011

SV	Naphthalene
3S	<0.0011
3D	<0.0011

SV	Naphthalene
4S	<0.0011
4D	<0.0011

SV	Naphthalene
5S	0.0019
5D	<0.0011

SV	Naphthalene
6S	0.0015
6D	<0.0011

A

B

C

TRENCH

CATCH BASIN

NEW GWETS COMPOUND

ELEC. BOX

0 20 40 60
SCALE IN FEET

LEGEND

- MW28 — MONITORING WELL
- EX6 — EXTRACTION WELL
- PIEZOMETER
- SOIL BORING LOCATION, MAY 2008
- CPT LOCATION FOR LITHOLOGIC DATA COLLECTION, MAY 2008
- PREVIOUS EXCAVATION
- SOIL BORING LOCATION, SEPTEMBER 2008
- SV-1S/D — SOIL VAPOR PROBE LOCATION, SEPTEMBER 2009
- µg/L — MICROGRAMS PER LITER
- SV-ID — SOIL VAPOR PROBE I.D.

SV	Naphthalene
1S	<0.0011
1D	<0.0011

SV-ID AND ANALYTE

ANALYTE CONCENTRATION IN (µg/L)

S = SHALLOW PROBE (5 ft bgs)

D = DEEP PROBE (12 ft bgs)

ft bgs = feet below ground surface

NOTES:

1. ALL CONCENTRATIONS ARE AT LEAST TWO ORDERS OF MAGNITUDE BELOW THE SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD ENVIRONMENTAL SCREENING LEVEL (ESL) FOR COMMERCIAL/INDUSTRIAL LAND USE (0.240 µg/L).
2. REFERENCE - TABLE E-2 SHALLOW SOIL GAS SCREENING LEVELS FOR EVALUATION OF POTENTIAL VAPOR INTRUSION CONCERNS, SF BAY RWQCB ENVIRONMENTAL SCREENING LEVELS - INTERIM FINAL - MAY 2007.

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

NAPHTHALENE CONCENTRATIONS IN SOIL VAPOR AUGUST 31 THROUGH SEPTEMBER 3, 2009

ARCADIS

FIGURE 13

SV	B	T	E	Xm,p	Xo
3S	**2**	0.72	**5.2**	0.38	1.3
3D	**210**	**270**	**79**	**110**	25

SV	B	T	E	Xm,p	Xo
5S	0.00089	0.0026	0.00051	0.0016	0.00061
5D	0.011	0.014	0.0019	0.0046	0.0017

SV	B	T	E	Xm,p	Xo
6S	0.016	0.0063	0.003	0.0081	0.003
6D	0.012	0.014	<0.0032	0.0069	<0.0032

SV	B	T	E	Xm,p	Xo
1S	0.0047	0.013	0.021	0.074	0.025
1D	0.003	0.0038	0.00078	0.0023	0.00078

SV	B	T	E	Xm,p	Xo
4S	0.0022	0.004	0.0016	0.0039	0.0012
4D	0.0019	0.0026	0.0005	0.0016	0.00057

SV	B	T	E	Xm,p	Xo
2S	0.014	0.0066	0.0023	0.0067	0.0022
2D	0.0091	0.008	0.0016	0.0046	0.0016

LEGEND

- MW28 — MONITORING WELL
- EX6 — EXTRACTION WELL
- PIEZOMETER
- SOIL BORING LOCATION, MAY 2008
- CPT LOCATION FOR LITHOLOGIC DATA COLLECTION, MAY 2008
- PREVIOUS EXCAVATION
- SOIL BORING LOCATION, SEPTEMBER 2008
- SV-1S/D — SOIL VAPOR PROBE LOCATION, SEPTEMBER 2009
- µg/L — MICROGRAMS PER LITER OF AIR
- SV-ID — SOIL VAPOR PROBE I.D.

SV	B	T	E	Xm,p	Xo
1S	0.0047	0.013	0.021	0.074	0.025
1D	0.003	0.0038	0.00098	0.0023	0.00078

SV-ID AND ANALYTE

ANALYTE CONCENTRATION IN (µg/L)

B BENZENE
T TOLUENE
E ETHYLBENZENE
Xm,p m,p XYLENE
Xo o-XYLENE

S = SHALLOW PROBE (5 ft bgs)
D = DEEP PROBE (12 ft bgs)
ft bgs = feet below ground surface
BOLD INDICATES VALUE IS ABOVE THE ESL (SEE NOTE 1)

NOTES:

1. SOIL VAPOR DATA WAS COMPARED TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD ENVIRONMENTAL SCREENING LEVELS (ESLs) FOR COMMERCIAL/INDUSTRIAL LAND USE (TABLE E-2, INTERIM FINAL, MAY 2007).

   BENZENE - 0.280 µg/L
   TOLUENE - 180 µg/L
   ETHYLBENZENE - 3,3 µg/L
   XYLENES - 58 µg/L

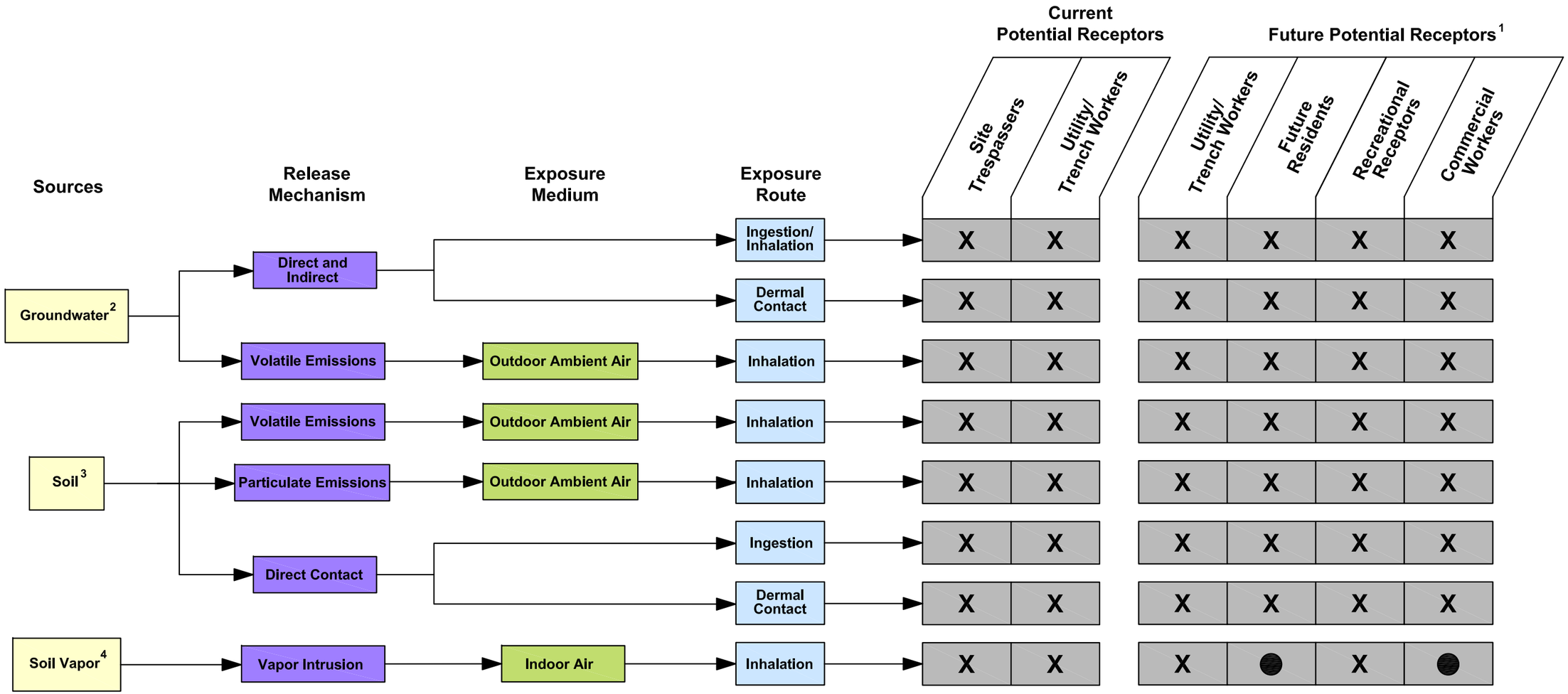
SCALE IN FEET: 0 20 40 60

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

BTEX CONCENTRATIONS IN SOIL VAPOR AUGUST 31 THROUGH SEPTEMBER 3, 2009

ARCADIS

FIGURE **14**



EXPLANATION

X INCOMPLETE PATHWAY

● POTENTIALLY COMPLETE PATHWAY

NOTES:

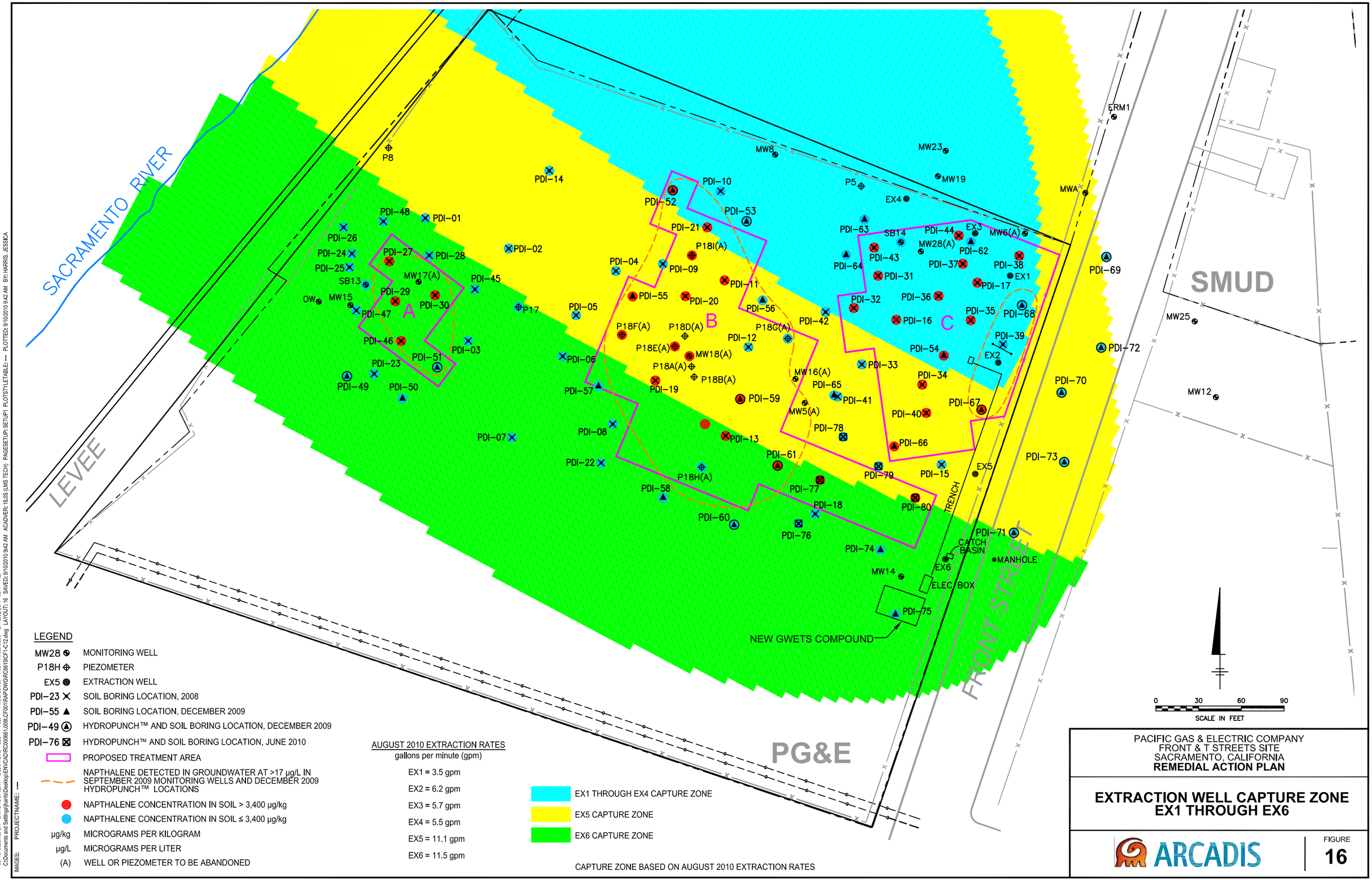
1. THE CURRENT LAND USE COVENANT RESTRICTS USE OF THE PARCEL FOR RESIDENTS. THE FUTURE RESIDENT POTENTIAL RECEPTOR WOULD REQUIRE A CHANGE IN THE LAND USE COVENANT.
2. GROUNDWATER IS INCOMPLETE PATHWAY BECAUSE LAND USE COVENANT IN PLACE. NO DIRECT OR INDIRECT CONTACT.
3. CAP IS INCLUDED IN LAND USE COVENANT AND IS A REQUIREMENT OF THE LUC.
4. CURRENT SITE CONDITIONS AND RECENTLY COLLECTED SOIL VAPOR DATA SUGGEST THAT THE ELEVATED CONCENTRATIONS OF BTEX MAY POSE A RISK TO POTENTIAL FUTURE OCCUPANTS OF BUILDINGS ONSITE. ARCADIS RECOMMENDS ADDITIONAL SOIL VAPOR SAMPLING FOLLOWING THE IMPLEMENTATION OF ENHANCEMENTS TO THE CURRENT GROUNDWATER REMEDY WHICH ARE LIKELY TO CHANGE SUBSURFACE SITE CONDITIONS.

PACIFIC GAS & ELECTRIC COMPANY
FRONT AND T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

CONCEPTUAL SITE MODEL EXPOSURE FLOW CHART

ARCADIS

FIGURE
15



LEGEND

MW28 ⊕	MONITORING WELL
P18H ⊕	PIEZOMETER
EX5 ●	EXTRACTION WELL
PDI-23 ✕	SOIL BORING LOCATION, 2008
PDI-55 ▲	SOIL BORING LOCATION, DECEMBER 2009
PDI-49 Ⓐ	HYDROPUNCH™ AND SOIL BORING LOCATION, DECEMBER 2009
PDI-76 ⊠	HYDROPUNCH™ AND SOIL BORING LOCATION, JUNE 2010
	PROPOSED TREATMENT AREA
	NAPTHALENE DETECTED IN GROUNDWATER AT >17 µg/L IN SEPTEMBER 2009 MONITORING WELLS AND DECEMBER 2009 HYDROPUNCH™ LOCATIONS
	NAPTHALENE CONCENTRATION IN SOIL > 3,400 µg/kg
	NAPTHALENE CONCENTRATION IN SOIL ≤ 3,400 µg/kg
µg/kg	MICROGRAMS PER KILOGRAM
µg/L	MICROGRAMS PER LITER
(A)	WELL OR PIEZOMETER TO BE ABANDONED

AUGUST 2010 EXTRACTION RATES
gallons per minute (gpm)

EX1 = 3.5 gpm
EX2 = 6.2 gpm
EX3 = 5.7 gpm
EX4 = 5.5 gpm
EX5 = 11.1 gpm
EX6 = 11.5 gpm

EX1 THROUGH EX4 CAPTURE ZONE
EX5 CAPTURE ZONE
EX6 CAPTURE ZONE

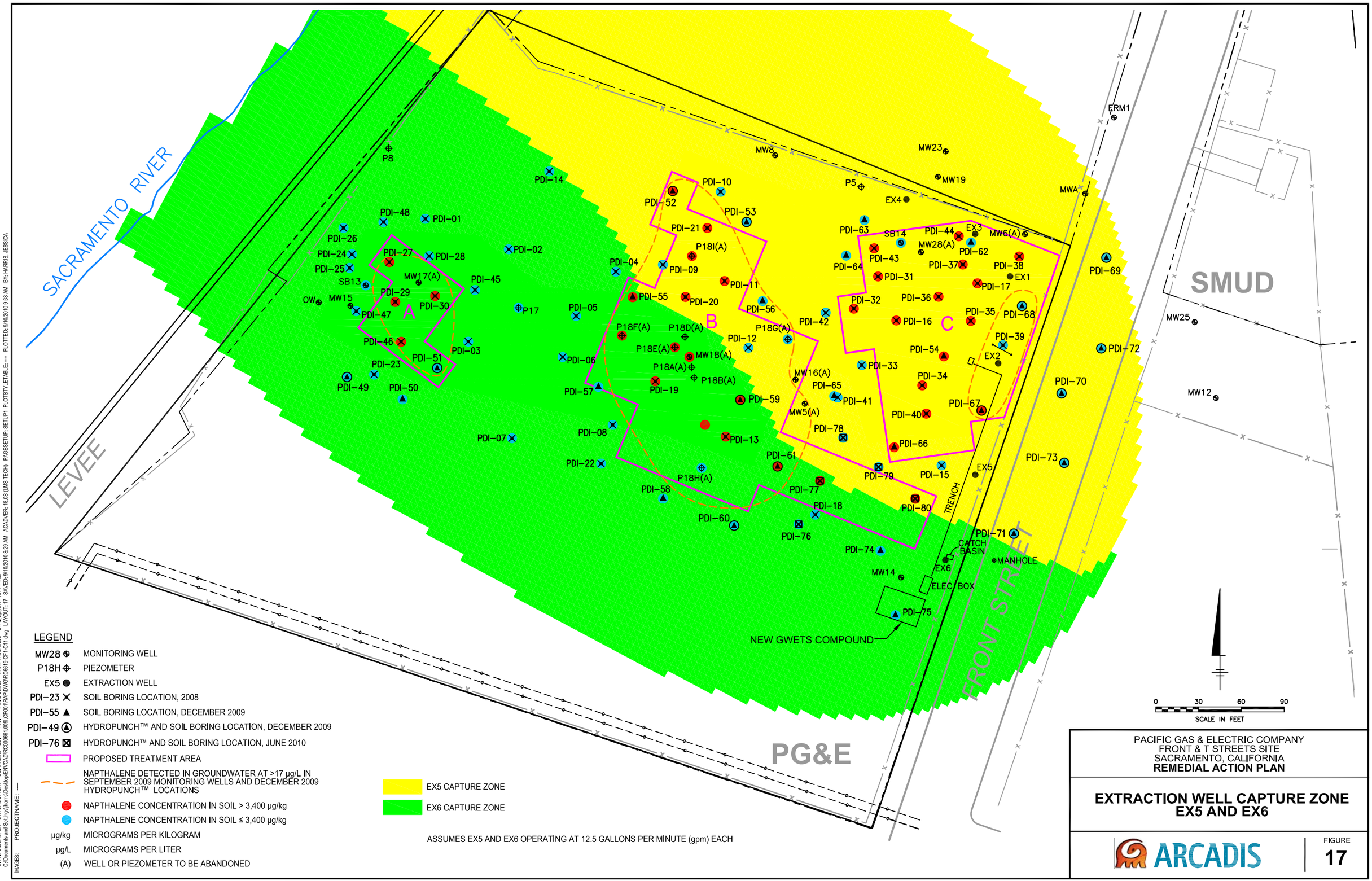
CAPTURE ZONE BASED ON AUGUST 2010 EXTRACTION RATES

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

EXTRACTION WELL CAPTURE ZONE EX1 THROUGH EX6

ARCADIS

FIGURE
16



LEGEND

MW28 ⊕	MONITORING WELL
P18H ⊕	PIEZOMETER
EX5 ●	EXTRACTION WELL
PDI-23 ✕	SOIL BORING LOCATION, 2008
PDI-55 ▲	SOIL BORING LOCATION, DECEMBER 2009
PDI-49 ⊛	HYDROPUNCH™ AND SOIL BORING LOCATION, DECEMBER 2009
PDI-76 ⊠	HYDROPUNCH™ AND SOIL BORING LOCATION, JUNE 2010
	PROPOSED TREATMENT AREA
	NAPTHALENE DETECTED IN GROUNDWATER AT >17 µg/L IN SEPTEMBER 2009 MONITORING WELLS AND DECEMBER 2009 HYDROPUNCH™ LOCATIONS
	NAPTHALENE CONCENTRATION IN SOIL > 3,400 µg/kg
	NAPTHALENE CONCENTRATION IN SOIL ≤ 3,400 µg/kg
µg/kg	MICROGRAMS PER KILOGRAM
µg/L	MICROGRAMS PER LITER
(A)	WELL OR PIEZOMETER TO BE ABANDONED

EX5 CAPTURE ZONE

EX6 CAPTURE ZONE

ASSUMES EX5 AND EX6 OPERATING AT 12.5 GALLONS PER MINUTE (gpm) EACH

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

EXTRACTION WELL CAPTURE ZONE EX5 AND EX6

ARCADIS

FIGURE
17

SACRAMENTO RIVER

LEVEE

FRONT STREET

TRENCH

SMUD

PG&E

NEW GWETS COMPOUND

A

B

C

P8

MW8

MW23

MW19

P5

EX4(A)

MWA

ERM1

PDI-14

PDI-10

PDI-52

PDI-53

PDI-21

P18I(A)

PDI-04

PDI-09

PDI-11

PDI-55

PDI-20

PDI-56

PDI-05

P18F(A)

P18D(A)

P18G(A)

PDI-12

P18E(A)

MW18(A)

PDI-06

P18A(A)

P18B(A)

PDI-57

PDI-19

PDI-59

MW16(A)

MW5(A)

PDI-65

PDI-41

PDI-78

PDI-07

PDI-13

PDI-08

PDI-61

PDI-22

P18H(A)

PDI-58

PDI-77

PDI-79

PDI-18

PDI-60

PDI-76

PDI-74

PDI-80

PDI-48

PDI-01

PDI-26

PDI-24

PDI-27

PDI-28

PDI-02

PDI-25

SB13

MW17(A)

PDI-45

PDI-29

PDI-30

OW

MW15

P17

PDI-47

PDI-46

PDI-03

PDI-51

PDI-23

PDI-49

PDI-50

PDI-63

SB14

PDI-44

EX3(A)

MW6(A)

PDI-64

PDI-43

MW28(A)

PDI-62

PDI-37

PDI-38

PDI-31

EX1(A)

PDI-17

PDI-32

PDI-36

PDI-35

PDI-68

PDI-16

PDI-39

PDI-54

EX2(A)

PDI-33

PDI-34

PDI-40

PDI-67

PDI-66

PDI-15

EX5

PDI-69

PDI-72

PDI-70

PDI-73

MW25

MW12

PDI-71

CATCH BASIN

MANHOLE

EX6

ELEC. BOX

MW14

PDI-75

LEGEND

MW28 ⊕	MONITORING WELL
P18H ⊕	PIEZOMETER
EX5 ●	EXTRACTION WELL
PDI-23 ✕	SOIL BORING LOCATION, 2008
PDI-55 ▲	SOIL BORING LOCATION, DECEMBER 2009
PDI-49 Ⓐ	HYDROPUNCH™ AND SOIL BORING LOCATION, DECEMBER 2009
PDI-76 ⊠	HYDROPUNCH™ AND SOIL BORING LOCATION, JUNE 2010
	PREVIOUS EXCAVATION
	PROPOSED TREATMENT AREA
	NAPTHALENE DETECTED IN GROUNDWATER AT >17 µg/L IN SEPTEMBER 2009 MONITORING WELLS AND DECEMBER 2009 HYDROPUNCH™ LOCATIONS
	NAPTHALENE CONCENTRATION IN SOIL > 3,400 µg/kg
	NAPTHALENE CONCENTRATION IN SOIL ≤ 3,400 µg/kg
µg/kg	MICROGRAMS PER KILOGRAM
µg/L	MICROGRAMS PER LITER
(A)	WELL OR PIEZOMETER TO BE ABANDONED

MINIMUM TREATMENT DEPTH
(feet below ground surface)

	45'
	40'
	35'
	30'
	25'

0 30 60 90
SCALE IN FEET

PACIFIC GAS & ELECTRIC COMPANY
FRONT & T STREETS SITE
SACRAMENTO, CALIFORNIA
REMEDIAL ACTION PLAN

PROPOSED TREATMENT AREA

ARCADIS

FIGURE
18

ARCADIS

Appendix A

Regulatory / Public Outreach
Documents Associated with the RAP

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

STATEMENT OF REASONS
REMEDIAL ACTION PLAN
PG&E Front & T Street Site

The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) has prepared this Statement of Reasons in to fulfill the requirements of California Health and Safety Code (HSC), section 25356.1(d). This statement of reasons will be appended to the Remedial Action Plan (RAP) for the PG&E Front & T Street Site located at 2000 Front Street in the City of Sacramento, County of Sacramento, California.

The RAP presents a summary of the Remedial Investigation (RI) and numerous Remedial Actions that have occurred at the site which have been undertaken to address the polycyclic aromatic hydrocarbons (PAHs) and benzene, toluene, ethylbenzene and xylene (collectively "BTEX") that have been detected in the soil and groundwater at the PG&E Front & T Street site. The draft RAP summarizes the remaining risks, includes a qualitative discussion of the potential risks to public health and the environment associated with vapor migration from contaminated soil and groundwater, and discusses the need to restore the groundwater beneath the site so it is available for beneficial uses. Currently PAHs and BTEX compounds have been detected at concentrations greater than the site specific cleanup levels. The RAP also provides a discussion of the remedial alternatives that were evaluated in the Feasibility Study (FS). The RAP recommends a remedial alternative that will meet the objectives of protecting public health and the environment. The RAP proposes remediation of groundwater and soil in the saturated zone by in-situ soil solidification/stabilization (ISSS) combined with continued operation of a groundwater extraction and treatment system (GWETS) and revision of the existing land use covenant (LUC).

DTSC believes that the attached RAP complies with the law as specified in California Health and Safety Code, section 25356.1. Section 25356.1(e) requires that RAPs "shall include a statement of reasons setting forth the basis for the removal and remedial actions selected." The statement of reasons "shall also include an evaluation of the consistency of the removal and remedial actions proposed by the plan with the federal regulations and factors specified in subdivision (d)..." Subdivision (d) specifies six factors against which the remedial alternatives in the RAP must be evaluated. The proposed remedial action is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan, "NCP"), the federal Superfund regulations. The attached RAP has addressed all these factors in detail. A brief summary of each factor follows. The statement of reasons also includes the preliminary Nonbinding Allocation of Responsibility (NBAR) as required by HSC section 25356.1(e).

1. Health and Safety Risks - Section 25356.1(d)(1)

The chemicals of concern identified for this site are PAHs and BTEX which have been detected in the soil and groundwater. The risk characterization evaluated potential exposures for a

trespasser on the site and a person utilizing the groundwater beneath the site. Currently there are no complete pathways identified. There are two exposure pathways that are likely to be completed. The first is the vapor intrusion pathway. Given plans for future land use in this area, it is likely that residences may be constructed on the site. The analytical results from soil vapor sampling conducted at the site suggest that the elevated concentrations of BTEX in soil vapor may pose a risk to future occupants of buildings onsite. Once the remedy is implemented additional sampling will be necessary to assess the reduction in vapor migration. The second likely pathway is exposure to contaminated groundwater. Given the growing reliance of Sacramento area water purveyors on groundwater it is likely that a water supply well could be placed in a location that is down gradient (downstream) from the site. Under this pathway, the public could be exposed to contaminated water which would be used for drinking, cooking and sanitation. The implementation of the remedy proposed in the RAP proposes actions to address both of these potential exposure pathways.

2. Beneficial Uses of the Site Resources - Section 25356.1(d)(2)

Implementation of the RAP will ultimately remove impediments to the redevelopment of the site. Currently the site is vacant and unused. Following implementation of this remedy additional sampling will be necessary to assess the reduction in vapor migration. Should the assessment and the associated risk assessment provide a reasonable basis for such an action, the LUC can be modified by DTSC and the current property owner to allow for additional uses.

Currently, groundwater flowing beneath the site becomes contaminated by PAH and BTEX compounds. Once ISSS is implemented, the GWETS will continue to operate until the contaminant levels in the groundwater are reduced below site specific cleanup objectives. The groundwater extraction and treatment system will then be placed on standby while additional monitoring is completed. Once groundwater concentrations decrease below levels of concern for a reasonable period of time, the GWETS will be decommissioned. Additional groundwater monitoring will continue until it is demonstrated that the groundwater flowing beneath the site is not being impacted above the site specific cleanup levels. Once the ISSS is implemented and demonstrated to achieve remedial action objectives groundwater that flows from beneath the site to other areas, will be available for use without needing the treatment currently provided by the GWETS.

3. Effect of the Remedial Actions on Groundwater Resources - Section 25356.1(d)(3)

Available technologies were evaluated to meet remedial action objectives for soil and groundwater. A variety of scientific engineering approaches and technologies were considered. The primary remedial action goals are to reduce PAH and BTEX concentrations in groundwater, limit the migration of PAH and BTEX from the soil into groundwater, and to prevent exposure to contaminated groundwater attributable to the site.

At this time, groundwater flowing beneath the site becomes contaminated by PAH and BTEX compounds. The contaminated groundwater is captured and treated by the existing GWETS. A recent evaluation determined that the GWETS would have to operate for over 300 years to attain the site specific cleanup levels. Once ISSS is implemented, the GWETS will continue to operate until the contaminant levels in the groundwater are reduced below levels of concern. The GWETS will then be placed on standby while additional monitoring is completed. Once groundwater concentrations decrease below levels of concern for a reasonable period of time, the GWETS will be decommissioned. Additional groundwater monitoring will continue until it is demonstrated that the groundwater flowing beneath the site is not being impacted above the site specific cleanup levels.

4. Site-Specific Characteristics - Section 25356.1(d)(4)

Chemicals in soil and groundwater beneath the site have been extensively characterized. There is a potential for off-site migration of contaminants. Should the GWETS become inoperative the contaminants will migrate from the site as groundwater flow in this area is influenced by the Sacramento River which lies just East of the Site.

5. Cost-Effectiveness of Alternative Remedial Action Measures - Section 25356.1(d)(5)

The proposed remedial action alternative, ISSS, combined with continued operation of the GWETS and revision of the existing land use covenant was found to be the most cost-effective alternative that could, in a reasonable time period reasonably attain the remedial action objectives appropriate to the site and that would allow for use of the site in a manner consistent with current proposed plans.

6. Potential Environmental Impacts of Remedial Actions – Section 25356.1(d)(6)

All potential impacts will be mitigated under the proposed remedial alternative. The proposed remedial alternative will not create any significant environmental impacts. Previously, the City of Sacramento prepared an Environmental Impact Report for the redevelopment of the site and surrounding areas. The City's EIR was sufficiently comprehensive to meet our obligations under CEQA. DTSC will be preparing an Addendum and filing a Notice of Determination after project approval.

7. Preliminary Nonbinding Allocation of Financial Responsibility - Section 25356.1(e)

The current NBAR for the PG&E Front & T Street Site located at 2000 Front Street in the City of Sacramento, County of Sacramento, State of California, as issued by the DTSC, is presented on the next page.

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

PRELIMINARY
NONBINDING ALLOCATION OF RESPONSIBILITY

PG&E Front & T Street Site
2000 Front Street
City of Sacramento
County of Sacramento
State of California.

Health and Safety Code (HSC) section 25356.1(e) requires the Department of Toxic Substances Control (DTSC) to prepare a preliminary nonbinding allocation of responsibility (the "NBAR"). HSC section 25356.3(a) allows potentially responsible parties (PRPs) with an aggregate allocation in excess of 50% to convene an arbitration proceeding by submitting to binding arbitration before an arbitration panel. If PRPs with over 50% of the allocation convene arbitration, then any other PRP wishing to do so may also submit to binding arbitration.

The sole purpose of the NBAR is to establish which PRPs will have an aggregate allocation in excess of 50% and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to DTSC, is not binding on anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are de novo and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in HSC section 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to HSC section 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary nonbinding allocation of responsibility for the PG&E Front & T Street site:

The Pacific Gas & Electric Company is allocated 100% of the responsibility for the PG&E Front & T Street Site.

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

NOTICE OF PUBLIC COMMENT PERIOD AND PUBLIC MEETING

DRAFT REMEDIAL ACTION PLAN
PG&E SACRAMENTO SITE
SACRAMENTO, CALIFORNIA

PUBLIC COMMENT PERIOD: April 29 to May 31, 2011
PUBLIC MEETING: May 18, 2011, 6:30 p.m. to 8:30 p.m.

The California Department of Toxic Substances Control (DTSC) invites you to comment on the draft Remedial Action Plan (RAP) for the PG&E Sacramento Site (Site) located at 2000 Front Street, Sacramento, CA. DTSC is the state agency responsible for regulating the generation, storage, treatment, and disposal of hazardous waste in California. The Site was the location of a manufactured gas plant from 1873 until 1956 that produced gas from raw coal and petroleum. The draft RAP describes the cleanup options evaluated by DTSC to address contaminants detected in soil and groundwater beneath the Site.

WHAT'S BEING PROPOSED? The draft RAP proposes an enhancement to the current groundwater remedy to reduce and control the source of contamination in the groundwater and soil more rapidly. Based on DTSC's review, in-situ soil stabilization and solidification (ISSS) is the recommended remedial alternative. When compared to the other alternatives, ISSS would require the least amount of long-term monitoring and maintenance to remain protective of human health and the environment, and would be the most effective long-term solution. Solidification and stabilization involve using a large auger to blend and pump a mixture of concrete and activated carbon into the ground where contaminants are located. Appropriate land use covenants and monitoring of remedy performance are also proposed during and after implementation.

PUBLIC COMMENT PERIOD: The public comment period for the draft RAP will run from April 29 to May 31, 2011. Written comments postmarked no later than May 31, 2011 must be sent to Sam Martinez, DTSC Project Manager, 8800 Cal Center Drive, Sacramento, CA 95826, or by email to SMartin2@dtsc.ca.gov.

PUBLIC MEETING: DTSC will hold a public meeting to present the draft RAP and accept public comments on May 18, 2011 from 6:30 p.m. to 8:30 p.m. at the California Auto Museum, 2200 Front Street, Sacramento, CA 95818.

WHERE DO I GET MORE INFORMATION? The draft RAP is available at the Sacramento Public Library Central Branch, 828 I Street, Sacramento, CA. Call (916) 264-2700 for library hours. The complete project record is available in DTSC's File Room at 8800 Cal Center Drive, Sacramento, CA 95826. Call (916) 255-3758 for an appointment. The draft RAP and project information is also available online at www.envirostor.dtsc.ca.gov.

CONTACT: If you have questions, please contact Sam Martinez, DTSC Project Manager, at (916) 255-6583 or by email at SMartin2@dtsc.ca.gov. For questions about public participation, call Marcus Simpson, DTSC Public Participation Specialist, at (916) 255-6683 or by email at MSimpson@dtsc.ca.gov.

Si prefiere hablar con alguien en español acerca de ésta información, favor de llamar a Jesus Cruz, DTSC. El número de teléfono es (866) 495-5651.

NOTICE TO HEARING-IMPAIRED INDIVIDUALS: TDD users can use the California Relay Service at (888) 877-5378. Please ask for Marcus Simpson, or email MSimpson@dtsc.ca.gov.

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

April 27, 2011

Ms. Liz Sewell, P.G.
Project Manager
ARCADIS
950 Glenn Drive, Suite 125
Folsom, California 95630

DRAFT REMEDIAL ACTION PLAN FOR THE FRONT & "T" STREET SITES, SACRAMENTO, CALIFORNIA

Dear Ms. Sewell:

The Department of Toxic Substances Control (DTSC) has completed review of the Draft Remedial Action Plan (draft RAP) dated April 27, 2011. The Draft RAP was prepared by ARCADIS for the Pacific Gas and Electric Company (PG&E). PG&E has taken a primary role in the coordinated remediation of the PG&E manufactured gas plant site, CalTrans I-5 Q Street off-ramp site, the SHRA 1920 Front Street site and the SMUD Front & "T" site. These sites are collectively referred to as the "Front & "T" Street sites." The draft RAP has been prepared in accordance with California Health and Safety Code 25356.1. A draft RAP presents the remedy selection process and a proposal to implement the selected remedy. The Draft RAP presents the selected remedial alternative, In-situ Soil Stabilization / Solidification (ISSS). Implementation of ISSS will encapsulate the contamination in the areas of highest impact and inhibit the release of those contaminants into the groundwater which flows beneath the site. The implementation of this remedy is protective of groundwater and will remove impediments from planned future development in this area. The Draft RAP is complete, acceptable and prepared in accordance with Departmental policies and at this time, it is appropriate to release the document for public comment.

With this approval PG&E will perform the following tasks related to the public comment period:

- Publish the approved Public Notice in the Sacramento Bee on Friday April 29th;
- Make revisions to the Fact Sheet as directed by DTSC and mail the Fact Sheet to all persons/groups on the approved mailing list; and
- Place a copy of the Draft RAP in the information Repository.

We look forward to holding a public meeting to receive public comment on and present the draft RAP.

Thank you for your continued attention and cooperation in this on-going remediation. Should you have any questions, please contact me at (916) 255-6583.

Sincerely,

Sam V. Martinez, Jr., P.E.
Hazardous Substances Engineer
Brownfields & Environmental Restoration Program

cc: **(All via e-mail)**

Mr. Darrell Klingman
Pacific Gas and Electric Company
3401 Crow Canyon Road, Room 177B
San Ramon, California 94583

Mr. Terry Winsor
ERRG, Inc
4585 Pacheco Boulevard, Suite 200
Martinez, California 94553

Ms. Beth Tincher
Senior Project Manager
Economic Development Department
915 I Street, Third Floor
Sacramento, California 95814

Mr. Douglas Coleman
Environmental Engineer
California Department of Transportation, District 3
703 B Street
Marysville, California 95901

cc: Ms. Lourdes Jimenez-Price
Office of the General Counsel
Sacramento Municipal Utility District
6201 "S" Street, MS B406
Sacramento, California 95817-1899

Mr. Jim Gardner
Safety, Health and Environmental Specialist
Safety, Health and Environmental Services
Sacramento Municipal Utility District
6201 S Street, Mail Stop B203
Sacramento, California 95817-1899

Mr. Roberto Cervantes, PE, LEED AP
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, California 95670

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

DRAFT REMEDIAL ACTION PLAN
APPROVAL RECORD

Site Name: PG&E Front & T Street Site
2000 Front Street
City of Sacramento
County of Sacramento
State of California

I have reviewed or been briefed on the Draft Remedial Action Plan prepared by ARCADIS on behalf of the Pacific Gas & Electric Company. The document is complete, acceptable and prepared in accordance with Departmental policies. I concur that release to the public for a comment period of no less than 30 days is appropriate.

Sam V. Martinez, P.E., Project Manager — Date 4/26/2011

Richard B. Hume, P.E., Chief
National Priorities List Unit — Date 4/24/2011

Charlie Ridenour, Performance Manager
Brownfields and Environmental Restoration Program — Date 4/26/2011

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Pacific Gas and Electric Company

Public Participation Plan

PG&E Sacramento Site
Sacramento, California

April 2011

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

PUBLIC PARTICIPATION PLAN
APPROVAL RECORD

Site Name: PG&E Sacramento Site
2000 Front Street
City of Sacramento
County of Sacramento
State of California

The undersigned have the Public Participation Plan prepared by ARCADIS on behalf of the Pacific Gas & Electric Company. The document is complete, acceptable and prepared in accordance with Departmental policies. This document is hereby approved.

Sam V. Martinez, P.E., Project Manager — Date: 4-19-2011

Marcus Simpson
Public Participation Specialist — Date: 4-19-11

ARCADIS

Public Participation Plan

PG&E Sacramento Site
Sacramento, California

Steven Perry
Environmental Scientist / Public Participation Specialist

Alison Jones, PE, Ph D
Engineer of Record

Liz Sewell, PG
Project Manager

Prepared for:
Pacific Gas and Electric Company

Prepared by:
ARCADIS U.S., Inc.
155 Montgomery Street
Suite 1510
San Francisco
California 94104
Tel 415.374.2744
Fax 415.374.2745

Our Ref.:
RC000661.009l.CF002

Date:
April 2011

Executive Summary

This Public Participation Plan (PPP) is written to provide members of the community information about the Pacific Gas and Electric Company (PG&E) Sacramento Site and the measures being taken by the Department of Toxic Substances Control (DTSC) and PG&E to inform and engage the public throughout the environmental investigation and cleanup process.

The PG&E Sacramento Site is located at 2000 Front Street, north of Broadway and between Interstate 5 and the Sacramento River, in the city of Sacramento. A former manufactured gas plant (MGP) operated there from 1873 until 1930, producing gas from coal and petroleum to light and heat local businesses and homes. With the arrival of natural gas in the 1930s, most of the manufactured gas plant sites in California were no longer needed, however this MGP was placed on standby until 1956 and demolished in 1961. Environmental investigations later identified residual materials from the manufacturing process that have affected soil and groundwater, requiring remedial action to protect public health and the environment.

Contaminants of concern, including benzene, toluene, xylene, and ethylbenzene (BTEX) and a group of compounds known as polycyclic aromatic hydrocarbons (PAHs), in soil and groundwater beneath the Site are the focus of cleanup activities being conducted by PG&E with regulatory oversight by DTSC. Several cleanup actions are already complete or underway, including removal of soil followed by placing an engineered cap across the vast majority of the Site to prevent exposure to residual materials (note the cap does not cover the existing gas transmission pipelines to allow access to the pipelines for inspection). A groundwater extraction and treatment system has operated for several years to remove contaminants, and a network of monitoring wells is in place to track effectiveness of the remedial measures and guide decision making.

Although more than 1,000 pounds of contaminants have already been removed from groundwater, at the present rate it would take much too long to fully remediate the Site using only the current measures. Therefore, additional actions are proposed to enhance existing measures and achieve cleanup objectives more quickly. DTSC is planning to issue a draft Remedial Action Plan (RAP) that describes the proposed measures to stabilize and solidify the contaminants in place within the subsurface soil so they no longer affect groundwater under or near the property.

Inside this PPP, you will find an overview of several public outreach activities DTSC and PG&E will use to keep you informed and provide opportunities to participate in the decision-making process, including:

- Mailing and email lists to notify you, local officials, and other stakeholders of project activities
- Fact sheets to summarize the draft RAP or other milestones in the cleanup process
- Public meetings to update the community and invite questions and comments
- Community interviews and briefings to increase awareness and encourage communication
- Online tools and information repositories, including the Central Branch of the Sacramento Public Library, to house key project documents and make them easily accessible for reading and review

We appreciate your interest in the PG&E Sacramento Site and hope you find this PPP helpful in understanding more about the Site and how to engage in the cleanup process. If you have questions or concerns about the Site or this PPP, we encourage you to contact the DTSC and PG&E representatives identified in this Plan (see Section 5.1.1).

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Acronyms and Abbreviations

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
Caltrans	California Department of Transportation
COCs	contaminants of concern
DTSC	Department of Toxic Substances Control
GCL	geosynthetic clay liner
GWETS	groundwater extraction and treatment system
ISSS	in-situ soil stabilization / solidification
LUC	land use covenant
MGP	manufactured gas plant
PAHs	polycyclic aromatic hydrocarbons
PG&E	Pacific Gas and Electric Company
PPP	Public Participation Plan
RAO	remedial action objective
RAP	Remedial Action Plan
RWQCB	Regional Water Quality Control Board, Central Valley Region
SHRA	Sacramento Housing and Redevelopment Agency
SMUD	Sacramento Municipal Utility District
SRCSD	Sacramento Regional County Sanitation District
SVETS	soil vapor extraction and treatment system
TPH	total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency

1. Introduction

ARCADIS has prepared this Public Participation Plan (PPP) on behalf of Pacific Gas and Electric Company (PG&E), with input and oversight from the Department of Toxic Substances Control (DTSC), for the PG&E Sacramento Site (Site) located at 2000 Front Street in Sacramento, California (see Appendix A). This PPP is designed to comply with DTSC guidance and regulatory requirements for public participation, including the DTSC Public Participation Manual (2001).

The purpose of this PPP is to: 1) document community interests and concerns related to environmental investigation and cleanup activities, and 2) identify specific public participation activities that will facilitate community involvement in the DTSC decision-making process throughout the Site cleanup process.

This PPP includes a description of the Site, its surrounding area, and its current land uses; a description of the Site investigations and the identified contaminants of concern; and an overview of the completed cleanup activities and other remedial activities. It also includes a brief description and data about the surrounding community and the public participation activities that have been completed or will be completed throughout the project.

To support development of this PPP, DTSC conducted an initial assessment of community awareness and concerns through a survey questionnaire that was distributed in November 2010. Based on those results, DTSC conducted additional public outreach in early 2011 through in-person interviews with community members, local business owners and organizations, and with several elected officials, agencies, and departments with jurisdiction or an interest in the Site and adjacent community.

This PPP will be updated as necessary to accommodate changes in the project or level of interest by the local community.

2. Site/Facility History and Background

2.1 Area History

Sacramento is the capital of the State of California and the county seat of Sacramento County. Located in California's Central Valley, it is the seventh most populous city in California, with a population of approximately 450,000 people (City of Sacramento 2010).

Founded in 1849, Sacramento is the oldest incorporated city in California. The California Gold Rush of the 1840s helped the city prosper in its early years. Later, Sacramento became a major distribution and transportation point for the Pony Express and the First Transcontinental Railroad. In 1879, Sacramento became the permanent State Capital.

Sacramento is called the "River City" because it is intersected by two major rivers – the American and the Sacramento. Both rivers are international attractions for rafters, kayakers, and boaters. In Sacramento, the American River has a 23-mile tree-lined parkway running along it that is used by joggers, walkers, and cyclists. The Sacramento River provides a deep-water port connected to the San Francisco Bay via a 43-mile channel allowing both international shipping and casual day trips to the Bay Area.

2.2 Site History

In the mid 1800s and early 1900s, before natural gas was available as an energy source, manufactured gas plants (MGPs) existed throughout California and the rest of the United States. These plants used coal and oil to produce gas for lighting, heating, and cooking. At the time, this technology was a major step forward, revolutionizing street lighting, enhancing public safety, and enabling businesses to work into the night. In addition to gas, MGPs produced a variety of byproducts, some of which were useful and marketable, such as coal tar and lampblack. The byproducts that could not be sold were removed for disposal or remained at the MGP.

PG&E or predecessor companies operated an MGP on the PG&E parcel at 2000 Front Street between 1873 and 1930. With the arrival of natural gas in the 1930s, most of the manufactured gas plants in California were no longer needed, however this MGP was placed on standby until 1956 and was demolished in 1961. The remediation includes four individual parcels: the former PG&E Sacramento MGP Site; the California

Department of Transportation (Caltrans) 1-5 Q Street Off-ramp Site; the Sacramento Housing and Redevelopment Agency (SHRA) 1920 Front Street Site; and the Sacramento Municipal Utility District (SMUD) Front and T Street Site. In April 2001, PG&E assumed responsibility for remediation following the execution of settlement agreements with the other three property owners. The focus of this PPP is on the PG&E Sacramento MGP parcel since remedial action for the other three parcels has been completed and certified by DTSC. Some remedial activities are ongoing such as land use control and groundwater monitoring.

2.3 Current Land Uses

The Site is located along the Sacramento River in the southeastern portion of the Sacramento Valley approximately 1.6 miles south of the confluence of the American and Sacramento Rivers. The Site is bordered by undeveloped land to the north, a railroad track and the Sacramento River to the west, and commercial properties to the south and east. Except at the levee along the western edge of the Site, the Site is essentially level with a gradual slope to the east. Monitoring wells are located on each parcel and within the Front Street right-of-way.

The majority of the Site is capped with a DTSC-approved engineered cap that consists of a top surface of asphalt and fine gravel over a 6-inch layer of crushed stone material. Both of these layers overlie more than 2 inches of sand and a geosynthetic clay liner (GCL). Imported backfill or native soils are located immediately beneath the clay liner. In addition to the cap, a groundwater extraction and treatment system (GWETS) currently operates at the Site.

2.4 Site Investigations and Contaminants of Concern

Residuals of the manufactured gas process include lampblack, tar, total petroleum hydrocarbons (TPH), and spent oxides. Although a large amount of contamination and associated soil has already been removed from the Site, contaminants associated with these MGP residues have been detected in soil and groundwater beneath the Site. The primary contaminants of concern (COCs) in both soil and groundwater are benzene, toluene, ethylbenzene, and xylenes (BTEX), as well as polycyclic aromatic hydrocarbons (PAHs), including naphthalene.

Based on past investigations, COCs remain tied up in the finer soil of the uppermost saturated zone (depths of approximately 18 feet below ground surface [bgs]) and extend into immediately underlying soils, typically extending to depths of between 25

and 40 feet bgs. Exposure to contamination at the PG&E parcel remains a concern because of the presence of COCs in soil, groundwater, and soil vapor. COCs in soil that could be an ongoing source for groundwater contamination is confined within the boundaries of the PG&E parcel and found in three areas: the west-central portion, the central portion, and the northeastern portion. The highest concentrations of COCs in groundwater have historically been found in the central portion of the PG&E parcel. The northeastern and west-central portions of the parcel have typically had COC concentrations less than the central area. PAHs and BTEX concentrations in soil vapor generally correspond with areas of the Site where higher concentrations of PAHs and BTEX had previously been detected in soil and/or groundwater samples.

2.5 Remedial Actions to Date

Numerous remedial investigations, soil removal actions, and many years of groundwater extraction and treatment have been conducted at the Site. Remedial activities to date include: capping the PG&E parcel with a GCL, soil excavations, operation of a soil vapor extraction and treatment system (SVETS), and operation of a GWETS. Additionally, land use covenants (LUCs; e.g., deed restrictions) that enhance control over the risk of exposure to any remaining COCs at the Site have been recorded in Sacramento County for each of the parcels. The LUC for the PG&E parcel restricts human habitation, including residences, hospitals, schools for persons under age 21, day-care centers, hotels, motels, or residences for employees. The LUC also restricts disturbance of the existing engineered cap over the property and requires that the DTSC be notified prior to a change in property ownership.

2.6 Remedial Action Certifications

Remedial action certifications were completed by DTSC for the SHRA, Caltrans, and SMUD parcels on April 30, 2008. The remedial action certification for each of the parcels states that DTSC has determined that all appropriate removal/remedial actions have been completed and that all acceptable engineering practices were implemented; however, the parcels require ongoing operation and maintenance (O&M) and monitoring efforts. With the completion of the certification process, these parcels have been deleted from DTSC's active site list and placed on the list of sites undergoing O&M to ensure proper monitoring of long-term cleanup efforts.

Remedial action certification for the PG&E parcel is anticipated following implementation of the additional remedial actions proposed in the draft Remedial Action Plan (RAP) under preparation at the time this PPP was published. The draft

RAP is briefly summarized below and, when issued for public review and comment, will be available to the community in the Site document repositories (see Section 5.1.8).

2.7 Overview of the Draft Remedial Action Plan

To accelerate the time to Site closure, the draft RAP proposes several enhancements to the current groundwater remedy. The draft RAP serves as DTSC's remedy selection document, subject to community input and public comment before the document is finalized, approved, and implemented. Once issued and available for public review, the community is encouraged to submit comments on the draft RAP and participate in the remedial decision-making process. As further described in Section 5 of this PPP, a fact sheet summarizing the major details of the draft RAP will be mailed to interested parties when the draft RAP is issued for public review. The fact sheet will specify the beginning and ending dates of a 30-day public comment period, and the time and location of a public meeting. In addition, public notification of the comment period and availability of the draft RAP for public review and comment will be published in local newspapers.

The current approved and operating remedy for groundwater remediation at the Site is based on the assumption that remedial action objectives (RAOs) will be achieved by continued operation of the GWETS, natural breakdown of contaminants, and hydraulic containment. However, hydraulic conditions at the Site have changed following decommissioning of the nearby Ranney Collector (a high yielding, large diameter pumping well that provided water for cooling buildings in downtown Sacramento) in 2009, necessitating a re-evaluation of the groundwater remedial strategy. Additionally, the current approved remedy does not include a timeframe or strategy for shutdown of the GWETS. If the rate of contaminant removal by the GWETS were assumed to be constant, it would take several hundred years to extract the BTEX compounds and more than a thousand years to reduce the PAHs.

As described in the draft RAP, various technologies to enhance the current groundwater remediation strategy are identified and evaluated. The range of technologies that are likely to be effective and that would be relatively easy to moderately complicated to implement and that were retained for further consideration include: continued operation of the GWETS; operation of an expanded GWETS; installation of a physical barrier; and in-situ soil stabilization/solidification (ISSS).

Based on the review described in the draft RAP, ISSS is the recommended remedial alternative for the Site. Of the solutions considered, ISSS would require the least

amount of long-term monitoring and maintenance to remain protective of human health and the environment, and would be the most effective long-term solution. ISSS relies on solidification and stabilization of soil and contaminants in place:

- Solidification involves using a large auger to pump and blend a concrete mixture into the ground where contaminants are located and too deep to remove using conventional equipment. The concrete mixture encapsulates the contamination, making it much less permeable than the surrounding soil. This reduces contaminant movement by decreasing the surface area exposed to groundwater.

- Stabilization in this case involves adding activated carbon to the concrete mixture. The activated carbon is blended into the soil and chemically reacts with the contaminants to immobilize them in place.

Before ISSS is performed, approximately 12 feet of clean soil will be removed from the areas of the Site targeted for treatment. The soil will be stockpiled and reused at the Site, reducing the need for truck traffic on local roadways. The large auger will then be placed down into the excavation to inject and mix concrete and activated carbon with the soil. Monitoring will be conducted to assess the noise, dust, and odors from the work. If this monitoring indicates a potential threat to public health and safety, steps will be taken to protect workers and the surrounding community. For example, the auger can be equipped with a shroud or cover to prevent or reduce odors.

Implementation of the construction phase of ISSS is estimated to require several months but is expected to be completed within one construction season. Completion of the ISSS will be followed by continued operation of the GWETS system and groundwater monitoring until the groundwater cleanup levels are achieved. Preliminary groundwater modeling indicates that the GWETS will need to operate for approximately 5 years following completion of the ISSS.

Following implementation of the ISSS remedy, maintenance of the engineered cap to limit surface water infiltration and decrease the potential for transport of COCs from affected soil to groundwater will no longer be necessary. The existing LUC for the PG&E parcel would therefore be modified to include maintenance of a clean soil cover/vegetated cap or asphalt cap to minimize physical contact with the subsurface instead of the current engineered cap.

The current LUC prevents the PG&E parcel from being used for residential purposes. This prohibition will remain since some level of contamination will remain at the Site.

However, the LUC will be updated to reflect the implementation of ISSS and to include a map of the areas and depths of ISSS treatment.

Following implementation of ISSS, concentrations in groundwater at the compliance point are projected to be reduced to below RAOs within approximately 5 years. Once RAOs are achieved and all appropriate controls are in place, DTSC will issue a certification.

2.8 Agency Involvement

In April 2001, PG&E assumed responsibility for cleaning up the Site through the execution of settlement agreements with each of the other three property owners (SHRA, Caltrans, and SMUD). As such, the other property owners will continue to be copied on all of the project correspondence but will not directly participate in remedial activities.

DTSC will continue to serve as the Lead Agency to oversee remedial activities. The Regional Water Quality Control Board, Central Valley Region (RWQCB) will be copied on all reports and may provide comments on the groundwater cleanup. The Sacramento Regional County Sanitation District (SRCSD) and the City of Sacramento will also help oversee the groundwater treatment system discharge because treated water from the GWETS is currently discharged to the sanitation system. If these or other agencies require permits regarding implementation of the proposed ISSS remedy or other aspects of the work, necessary permits will be obtained.

3. Community Characteristics

This section provides information about the City and County of Sacramento within which the Site is located, including a brief summary of demographic and local government organization information. This section also describes steps DTSC has taken to engage the community in the Site's remedial program, including summaries of community surveys and interviews conducted to inform this PPP.

3.1 Community Profile

3.1.1 Sacramento County

Sacramento County was incorporated in 1850 as one of the original 27 counties of California. The county encompasses approximately 994 square miles in the middle of the 400-mile long Central Valley, which is California's prime agricultural region (Sacramento County 2010). The county extends from the low delta lands between the Sacramento and San Joaquin Rivers north to about 10 miles beyond the State Capitol and east to the foothills of the Sierra Nevada Mountains. The southernmost portion of Sacramento County has direct access to the San Francisco Bay.

Table 1 presents basic demographic population data from the U.S. Census Bureau for Sacramento County in 2009.

Sacramento County has a charter form of government. It is governed by a five-member Board of Supervisors elected to serve 4-year terms. Each member is elected from one of the five supervisorial districts of the county. District boundaries are adjusted after every federal census to equalize district population. The Site is located in District 1.

The Board of Supervisors convenes each Tuesday and the second and fourth Wednesdays at the County Administration Center, 700 H Street, Room 1450, in Sacramento. Meetings begin at 9:30 a.m. on Tuesdays and Wednesdays. On the second Wednesday of the month, there is also a night Board session that begins at 6:00 p.m. The meetings are open, and the public is invited to attend.

Table 1 Sacramento County Population Details

Category	Sacramento County	California
Population, 2009 estimate	1,400,949	36,961,664
Population, percent change, 4/1/2000 to 7/1/2009	14.5%	9.1%
Population, 2000 base	1,223,497	33,871,648
Persons under 5 years old, 2009	7.6%	7.5%
Persons under 18 years old, 2009	25.8%	25.5%
Persons 65 years old and over, 2009	11.3%	11.2%
Female persons, 2009	50.8%	49.9%
White persons, 2009	69.3%	76.4%
Black persons, 2009	10.5%	6.6%
American Indian and Alaska Native persons, 2009	1.3%	1.2%
Asian persons, 2009	13.6%	12.7%
Native Hawaiian and Other Pacific Islander, 2009	0.9%	0.4%
Persons reporting two or more races, 2009	4.4%	2.6%
Persons of Hispanic or Latino origin, 2009	20.5%	37.0%
White persons not Hispanic, 2009	51.4%	41.7%
Median value of owner-occupied housing units, 2000	$144,200	$211,500
Households, 2000	453,602	11,502,870
Persons per household, 2000	2.64	2.87
Median household income, 2008	$56,882	$61,017

Source: U.S. Census Bureau 2010a

3.1.2 City of Sacramento

The City of Sacramento is the most populous city in Sacramento County and the seventh most populous city in the State of California. The city's economy is broadly based, although government is the largest employer with 25 percent of California's 471,000 government employees. Transportation is a large sector, along with information technology, leisure and hospitality, professional and business services, higher education, health services and research, and construction.

Besides being the capitol of California, Sacramento is also home to the California State University Sacramento, the Sacramento Zoo, the Sacramento Convention Center, and the Sacramento International Airport. The University of California at Davis is also a

short distance from downtown Sacramento. The city boasts a historic district, a marina, a farmers' market, and a variety of museums and cultural events.

Table 2 provides a summary of the City of Sacramento's population data from the U.S. Census Bureau from 2009.

Table 2 City of Sacramento Population Details

Category	City of Sacramento	California
Population, 2006 estimate	453,781	36,457,549
Population, percent change, 4/1/2000 to 7/1/2006	11.5%	7.6%
Population, 2000 base	407,018	33,871,648
Persons under 5 years old, 2000	7.1%	7.3%
Persons under 18 years old, 2000	27.3%	27.3%
Persons 65 years old and over, 2000	11.4%	10.6%
Female persons, 2000	51.4%	50.2%
White persons, 2000	48.3%	59.5%
Black persons, 2000	15.5%	6.7%
American Indian and Alaska Native persons, 2000	1.3%	1.0%
Asian persons, percent, 2000	16.6%	10.9%
Native Hawaiian and Other Pacific Islander, 2000	0.9%	0.3%
Persons reporting two or more races, 2000	6.4%	4.7%
Persons of Hispanic or Latino origin, 2000	21.6%	32.4%
Housing units, 2000	163,957	12,214,549
Homeownership rate, 2000	50.1%	56.9%
Median value of owner-occupied housing units, 2000	$128,800	$211,500
Households, 2000	154,581	11,502,870
Persons per household, 2000	2.57	2.87
Median household income, 1999	$37,049	$47,493

Source: U.S. Census Bureau 2010b

The City of Sacramento operates with a City Council Manager form of government. The City Council consists of a mayor, elected by all city voters, and eight council members, elected to represent separate districts in the city. The mayor and council members serve 4-year terms, and the elections are staggered.

The City Council holds public meetings most Tuesday afternoons and evenings, at 2:00 p.m. and 6:00 p.m., respectively, in the City Council Chamber of City Hall, located at 915 I Street. The council also holds special meetings and committee meetings, which are open to the public. Agendas for City Council and Council Committee meetings are available in the City Clerk's Office in the Historic City Hall building. The Mayor and City Council Offices are located in City Hall.

3.1.3 Sacramento Housing and Redevelopment Agency

The Sacramento Housing and Redevelopment Agency (SHRA) was created as a Joint Powers Agency in 1981 by the Sacramento City Council and Sacramento Board of Supervisors. SHRA brings together financial resources and staff expertise to revitalize lower income communities, create affordable housing opportunities, and serve the public housing residents as the Housing Authority for the City and County of Sacramento. An ongoing SHRA project related to the Site is redevelopment of the waterfront for recreational, commercial, and residential use. Currently known as "The Docks" project, SHRA's goal is to eventually include the Site in that redevelopment after the Site is remediated and appropriate LUCs are in place.

3.2 Community Involvement

DTSC maintains a policy of communicating Site activities to the surrounding community and engaging the community in the decision-making processes associated with the Site cleanup. DTSC has worked closely with PG&E and others to keep interested parties informed and to engage the community through the examples described below and through the additional public participation activities discussed in Section 5.

3.2.1 Community Survey

A community survey was conducted to gauge community awareness of the Site and interest in the project. The survey was mailed on November 29, 2010 to approximately 400 homes and businesses within approximately 0.25 mile of the Site and to other interested parties such as community leaders and elected officials. The survey included an introductory cover letter and a questionnaire to be returned to DTSC by December 15, 2010. Results are summarized in Section 4.

3.2.2 Community Interviews

In January and February 2011, DTSC conducted community interviews with 21 individuals from the Sacramento community to assess community issues, interest, and concerns in the environmental investigation and cleanup for the Site. Individuals representing the following categories participated in the interviews:

- Community residents
- Local businesses operating near the Site
- Representatives of local Business Associations and Partnerships
- Stake holding Sacramento City and County agencies
- Local Elected Officials

The summary of community concerns and issues presented in the next section is based on information gathered from community surveys and community interviews conducted from December 2010 through February 2011.

See Appendix B for a copy of the survey and cover letter, as well as DTSC's summary data compilation of responses to each question on the survey. See Appendix C for a copy of the interview questionnaire.

4. Community Concerns and Issues

4.1 Community Survey

The community survey questionnaire was mailed on November 29th, 2010. A total of 392 surveys were sent to a broad range of project stakeholders, including community residents and businesses within a 0.25-mile radius of the Site; state, federal, and local elected officials; Sacramento City and County officials; and various media outlets. Survey results were returned to DTSC by December 15, 2010, and results are summarized below. See Appendix B for a copy of the survey and cover letter, as well as DTSC's summary data compilation of responses to each question on the survey.

Overall, the survey return rate indicated a moderate to high level of interest in the Site and the latest remedial activities to be implemented under the forthcoming draft RAP. Thirty-four community surveys were completed and returned by respondents, a return rate of 8.7 percent. DTSC considers a survey return rate of 3 to 5 percent as normal. It should be noted, however, that not all survey item responses total 100 percent because some respondents did not answer all of the questions.

The survey indicated that a majority of the community is composed of a stable residential and workforce population. Fifty percent of respondents have lived or worked in the area for 15 years or more, and 18 percent have been in the area for 10 to 15 years. There also are new neighbors in the area, as the survey results indicate 32 percent of respondents have been in the area for 5 years or less.

In general, most respondents indicated they are familiar with the Site but do not have specific details. Interest in the Site was indicated as high, with 44 percent of the respondents indicating they are "very interested" and 35 percent responding they have "some interest" in the Site. Only 12 percent said that they have no interest in the Site.

The majority of respondents indicated they would like to be included in future correspondence about the Site and its cleanup. Fact sheets and newsletters were identified as the preferred method of communication, along with newspaper notices in the Sacramento Bee. More than half of the respondents (53 percent) indicated that they would like to be kept on the project mailing list to receive future information.

Twenty-one out of 34 survey participants stated they either might, or would, attend a community meeting about the project. A local community center (Southside Park

Community Center) was identified by some respondents as a suitable and convenient meeting location.

The majority of respondents (97 percent) indicated that they preferred to receive future correspondence in English. Only 1 of the 34 respondents indicated that Spanish was the preferred language.

When it comes to direct contact, 35 percent of the respondents stated that it would be okay to contact them directly to discuss the Site and project. Thirty-eight percent responded to the statement “please do not contact me.”

4.2 Community Interviews

After the completion of the community survey, DTSC and PG&E completed community interviews to gather more detailed information from the local community. In general, all of the participants interviewed characterized themselves as having at least ”some” interest in the project, but several interviewees stated they were “very” interested in the cleanup of the Site. It was concluded from this information that there is a moderate level of interest in the Site. The following subsections contain summaries of the key issues and concerns raised during the community surveys and interviews. These summaries of concerns and key issues are not meant to describe community concerns in complete detail, but will provide readers with a general idea of some of the primary concerns and issues raised by the public.

4.3 Summary of Community Issues and Concerns

4.3.1 Potential Exposure to Hazardous Toxins

A primary concern that was expressed by many of the participants during the community survey and interviews was whether or not the public is at risk of being exposed to hazardous contamination. Nearly every interview participant indicated their concern that the contamination that is currently present at the Site be addressed to protect people from potential contamination. Some interview participants specifically asked what type of cleanup methods have been used at the Site already, and whether or not the planned remedial activities will successfully protect against exposure to contaminants.

Community members stated their concern and hopes that DTSC and PG&E ensure that the contamination at the Site does not negatively impact people’s health,

particularly that of Site workers and employees of nearby businesses. The community interviews also indicated that, despite public concerns about the contamination, community members expressed confidence in DTSC and PG&E's ability to clean up the Site.

4.3.2 Migration and Exposure to Contaminated Groundwater

Some interviewees expressed concern about the migration of contaminants in the groundwater beneath the Site. Local businesses that were interviewed made a point of expressing concerns about their employees being exposed to toxins in their drinking water. Interviewees were informed that the groundwater beneath the Site is not directly used for drinking purposes, and local area residences and businesses receive treated municipal water from their water lines.

Along with the concern of contamination migration, some people asked if the contaminated groundwater was being released into the Sacramento River, which is directly adjacent to the Site. In addition, the concern was raised by one County official that contaminant migration could be an issue if any local area extraction wells are drawing water from the area, as they could be pulling contamination along with it.

4.3.3 Proposed Cleanup Method

Some of the individuals who participated in the community interviews had very specific questions and concerns about the proposed cleanup method proposed for the Site, which, as of this time, is ISSS. This process would include injecting a cement and granulated or powdered carbon mixture into several borings at the Site, then blending it with soils underground to solidify the contamination once the mixture hardens. Interviewees requested details about the proposed cleanup method and how effective it will be.

Another concern expressed by community interview participants is the permanent nature of the proposed cleanup method. Particularly, there was the concern that once the large amount of cement hardens beneath the ground surface it will be in place in perpetuity, which could affect other subsequent cleanup methods being implemented at the Site. DTSC was strongly encouraged to look into other sites with similar contamination issues to see what other methods may have worked there, assess their feasibility for the PG&E Sacramento Site, and to consider those methods.

Some interviewees stressed their concern that DTSC has not carefully looked into other feasible cleanup options before deciding to implement the proposed ISSS method. Furthermore, concerns were raised by interviewees that the proper permits be acquired from the RWQCB before injecting materials into the aquifer, as is called for by the proposed cleanup method.

4.3.4 Subsequent Development of the Site Following Cleanup

Some of the interviewees questioned what the property is currently used for, and what the future use of the property will be after the cleanup plan is completed. Interview participants were informed that DTSC does not regulate property development, and can only legally regulate environmental investigations and cleanups. Given the history of the Site with respect to tentative development plans, and agencies involved with attempting to develop the property, DTSC realizes that the cleanup of the Site will likely affect subsequent development. The concern was also expressed by some interviewees that DTSC should establish goals for the cleanup that will be appropriate for a wide variety of site uses in the future.

4.3.5 Who Will Pay for the Cleanup?

One concern that arose during DTSC's community assessment was the question of who will pay the costs associated with cleaning up the Site. PG&E has assumed the role of being the primary Responsible Party for the investigation and cleanup of contamination and, as such, will pay for remediation.

4.3.6 Potential for Airborne Dust

Upon learning about the proposed cleanup plan, which involves drilling extensive borings to various depths, several interviewees expressed their concerns about dust migrating to nearby businesses and residences and posing a potentially hazardous threat. Interviewees asked for project details, and specifically, safety plan information and how the project technical team plans to mitigate potential airborne dust issues as a result of drilling borings at the Site.

4.3.7 Impacts to Local Roads and Traffic

Another concern that arose during the community assessment process was the potential impact that the project could have on the local roadways adjacent to the Site. The Site is located on Front Street, which was highly impacted in the summer of 2010

with unrelated construction projects in the nearby area. Some interview participants expressed their concern that local residents and businesses will again be impacted due to the cleanup project at the Site. Specifically, the notion of any potential road closures related to the cleanup was of prime concern. However, general impacts to traffic, lane detours, and parking on Front Street were also raised as concerns.

In addition, a parcel that sits next to the Site is used as a stable and rest area for the horses that pull the carriages on a daily basis in Old Sacramento. Old Sacramento is approximately 1 mile from the Site, and the horse-drawn carriages travel on Front Street to get to Old Sacramento. There was some concern raised that the trucks, possible traffic diversions, or other road impacts might interfere in some fashion with the horses and their daily transit from the rest site parcel to Old Sacramento.

4.3.8 Communication

When asked if they thought DTSC was providing adequate information about the investigation and cleanup of the Site, all interview participants stated they were satisfied with the level of information and project details they had received. Two community survey respondents stated that they had not heard about the Site, and expressed concern that the community survey was their first time receiving any Site information. While the topic of communication about the project was not raised as a primary concern or problem issue, most survey and interview participants stated their desire to remain knowledgeable about the ongoing progress of the investigation and cleanup of the Site. To that end, DTSC will ensure that opportunities for public involvement and project updates are provided to the community at project milestones.

With regard to future communication with the public about the Site, interview participants noted the following communication methods as being the best ways for keeping the public aware of the cleanup:

- Fact Sheets, newsletters, and written updates
- Public notices
- Community meetings

5. Public Participation Activities

Throughout implementation of remedial activities, DTSC and PG&E will continue to work closely together and with others in conducting public participation activities that inform and involve the community. The purpose of these activities is to provide meaningful opportunities for community input into the cleanup process. To achieve this end, DTSC and PG&E have established the following objectives for the public participation program:

- Provide the community timely and accurate information about the Site;
- Provide the community opportunities to ask questions and receive answers to their questions about the Site;
- Encourage community representatives to share their concerns and identify interests and issues associated with the Site; and
- Formally document community concerns and identify specific public participation activities to ensure that the community is involved in the decision-making process.

5.1 Recommended Public Participation Activities

Each of the activities that DTSC and PG&E will conduct is discussed in more detail below. These activities are designed to fulfill DTSC's public participation requirements and to meet the objectives stated above:

- To ensure that the public is informed throughout the cleanup process, DTSC and PG&E have developed a mailing list and will provide project updates, fact sheets, and work notices; provide documents and reports at a local information repository; publish public notices in local newspapers; conduct community briefings as needed; and hold public meetings as required.
- To encourage the public to share their concerns, DTSC and PG&E have conducted community surveys and interviews. In addition, DTSC and PG&E urge the public to contact the project team at any time with questions or concerns (see Section 5.1.1).
- To document community concerns, DTSC and PG&E will respond in a timely fashion to public comments made in person, by phone, by email, or in writing.

- To identify the best ways to address the public's concerns, DTSC and PG&E have incorporated the results of the community surveys and interviews into this PPP.

5.1.1 DTSC Project Contacts

Information contacts have been established for the public to direct questions and concerns about the project. These contacts will also be included on all information distributed to the public by DTSC and PG&E.

Sam Martinez
Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
SMartin2@dtsc.ca.gov
(916) 255-6583

Marcus Simpson
Public Participation Specialist
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
MSimpson@dtsc.ca.gov
(916) 255-6683 or toll free at 1-866-495-5651

5.1.2 Mailing and Email Lists

DTSC and PG&E developed a mailing list encompassing approximately a 0.25-mile radius around the Site boundaries. This list includes approximately 400 names and addresses of property owners and residents; business owners; survey and interview participants; local schools; public agencies; local organizations; and city, state, and federal elected officials. Additional names and addresses may be added to the mailing list by contacting either of the DTSC project contacts listed above. The mailing list will be updated prior to mailings to keep information as current as possible.

An email contact list has also been created to serve as an additional tool to interact with the community. Initially, the email list consists of state, local, and city officials, but community members may request to be added to the email list by contacting a DTSC project contact.

5.1.3 Fact Sheets

DTSC and PG&E will prepare fact sheets at key project milestones to provide interested parties and community members with information about the Site's cleanup activities. Fact sheets will be distributed to all parties on the mailing list and will be made available at the information repository and DTSC offices. Fact sheets will explain technical information in understandable terms so that the reader can understand what is taking place at the Site.

5.1.4 Community Briefings

Upon request from the community, DTSC and PG&E will conduct community briefings with interested community members, agency representatives, and local elected officials. Community briefings will be designed to provide key project information and updates to concerned and interested members of the public. The purpose of these briefings will be to ensure that the community has a good understanding of technical project issues, that the needs of the community are being identified and met, and to continue to build relationships and trust among DTSC, PG&E, and the community.

5.1.5 Public Meetings

At a minimum, DTSC and PG&E will conduct the legally required draft RAP public meeting for the project during the public comment period. At this meeting DTSC will present the proposed remedy, a summary of the contamination at the Site, the schedule for remedial activities, and describe the process for the public to submit formal comments. Other public meetings may be held as necessary to provide members of the community with an opportunity to meet the DTSC and PG&E project teams, listen to a presentation about activities at the Site, ask questions and receive answers to their questions from the project teams, and provide input to DTSC.

5.1.6 Public Comments

Public comments may be submitted through direct mail, phone calls, emails, and at the draft RAP public meeting. Following the public meeting and close of the associated public comment period, DTSC will issue a Response to Comments summary and provide a copy to all individuals who submitted comments. The Response to Comments will also become an official part of the project Administrative Record, will be made available for public review in the local information repository, and will also be available online at www.envirostor.dtsc.ca.gov/public. DTSC and PG&E may conduct

additional meetings, if necessary, to provide members of the public with project details and to accept community comments and input.

5.1.7 Public Comments

Public comments may be submitted through direct mail, phone calls, emails, and at public meetings. A Response to Comments summary will be prepared to address comments received during the public comment period. All individuals that provided comments will be sent a copy of the Response to Comments. In addition, the Response to Comments will be placed in the local information repository, the project's Administrative Record, and will also be available online at www.envirostor.dtsc.ca.gov/public.

5.1.8 Public Notices

Public notices will be published in the Sacramento Bee newspaper announcing the availability of public comment periods and public meetings.

The public notice will include the following information:

- A brief overview of the document and or meeting agenda
- The location of the information repositories where the community can find copies of the document for review
- The start and end dates of the public comment period
- The address to which members of the public can send written comments
- An announcement of the time, date, and location for the public meeting
- DTSC project staff contact information

5.1.9 Information Repositories

To facilitate community access to key technical documents, local information repositories have been established at the Central Branch of the Sacramento Public Library and at DTSC's Sacramento regional office. The repositories will include printed

and/or electronic copies of key technical documents, this PPP, project fact sheets, and additional project-related documents as they are developed and approved.

Sacramento Public Library – Central Branch
828 I Street
Sacramento, California 95814
(916) 264-2700
Hours: Monday – Closed; Tuesday – 9:00 a.m. to 8:00 p.m.; Wednesday/Thursday – 10:00 a.m. to 8:00 p.m.; Friday – 10:00 a.m. to 6:00 p.m.; Saturday – 1:00 p.m. to 5:00 p.m.; Sunday – 12:00 p.m. to 5:00 p.m.

Department of Toxic Substances Control - File Room
8800 Cal Center Drive
Sacramento, California 95826
(916) 255-3758 – call for an appointment
Hours: Monday through Friday – 8:00 a.m. to 5:00 p.m.

Many technical reports and other Site-related information are also available on-line at DTSC's website and document database: www.envirostor.dtsc.ca.gov/public.

5.1.10 Additional Activities

DTSC and PG&E may conduct additional outreach activities, such as the issuance of work notices, distribution of project updates via postcards or newsletters, and issuance of press releases to the local media, to ensure the community is kept informed during the life of the project.

If new information becomes available, and as community demographics and concerns change, DTSC and PG&E may update or addend this PPP to ensure that the information remains accurate, timely, and relevant to the project.

6. References

ARCADIS. 2011. Draft Remedial Action Plan (RAP): PG&E Front and T Streets Site, Sacramento, California.

California Environmental Protection Agency Department of Toxic Substances Control (DTSC). 2001. Public Participation Manual.

City of Sacramento. 2010. City of Sacramento, California website. http://www.cityofsacramento.org/

Sacramento County. 2010. Sacramento County, California website. http://www.saccounty.net/default.htm

U.S. Census Bureau. 2010a. Sacramento County QuickFacts. http://quickfacts.census.gov/qfd/states/06/06067.html

U.S. Census Bureau. 2010b. City of Sacramento QuickFacts. http://quickfacts.census.gov/qfd/states/06/0664000.html

Appendix A

Site Location Maps

REFERENCE: AERIAL PHOTOGRAPH OBTAINED FROM GOOGEL EARTH PRO, 2009, IMAGERY DATE: APRIL 7, 2010.

0 800' 1600'

APPROXIMATE GRAPHIC SCALE

AREA LOCATION

CALIFORNIA

PACIFIC GAS AND ELECTRIC COMPANY
PG&E SACRAMENTO SITE, SACRAMENTO, CALIFORNIA

PUBLIC PARTICIPATION PLAN
APRIL 2011

SITE LOCATION MAP

ARCADIS

APPENDIX
A

ARCADIS

Appendix B

Cover Letter, Community Survey, and DTSC Data Compilation

Linda S. Adams
Secretary for
Environmental Protection

Department of Toxic Substances Control

Maziar Movassaghi
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

Dear Community Member:

I want to take this opportunity to inform you of an environmental cleanup project at the PG&E Sacramento Site, a former manufactured gas plant (MGP) located at 2000 Front Street, Sacramento, California 95818. The MGP operated from 1873 until 1956, and produced gas from raw coal and petroleum. Various contaminants of concern have been discovered at the Site, and the California Department of Toxic Substances Control (DTSC) is regulating the environmental cleanup. We invite you to complete the enclosed community survey, which will help us determine the level of community interest and concern, as well as assist us in conducting the appropriate community involvement activities.

The Site is located between Interstate 5 and the Sacramento River, approximately 1,700 feet north of the intersection of Front Street and Broadway. Soil and groundwater at the Site has been contaminated with various chemicals of concern, including benzene, toluene, xylene, ethylbenzene, and a group of compounds known as polycyclic aromatic hydrocarbons, or PAHs. The contamination stems from past MGP operations, and several cleanup actions are already underway to address the soil and groundwater contamination. A soil cap has been installed to prevent exposure to contaminated soils, as well as an onsite groundwater treatment system to address groundwater contamination. Currently, the Site is vacant and fenced.

Additional cleanup measures are proposed to take place in 2011 to provide added protection against groundwater contamination. DTSC plans to issue a draft Remedial Action Plan (RAP) that describes the proposed cleanup measures. DTSC will circulate a fact sheet to the community which summarizes the proposed cleanup measures, provides details about the public comment period for the draft RAP and includes the date, time, and place for a public meeting to be held. The public comment period and public meeting for the draft RAP are the community's opportunity to learn more about the project and to voice concerns or questions about the proposed cleanup plan.

Your input on the enclosed survey will help us keep you and your community better informed about the project. Thank you for taking the time to fill out and return this community survey. Please return the survey by December 15, 2010. If you have any questions about the environmental activities at the Site or the attached survey, please contact me at 916-255-6683 (toll free at 1-866-495-5651), or by email at MSimpson@dtsc.ca.gov.

Sincerely,

Marcus Simpson
DTSC Public Participation Specialist
8800 Cal Center Drive
Sacramento, California 95826

PG&E SACRAMENTO SITE
2000 Front Street, Sacramento, California 95818

Community Survey Questionnaire

1. **How long have you lived or worked in this area?**

   ☐ 0-5 years ☐ 5-10 years ☐ 10-15 years ☐ 15 or more years

2. **What is your current knowledge of the PG&E Sacramento Site?**

   ☐ I do not know anything about this Site.

   ☐ I have heard about this Site, but have little or no information on it.

   ☐ I know a lot about this Site.

3. **How interested are you in the PG&E Sacramento Site?**

   ☐ I do not know anything about this Site and cannot tell you if I am interested or not.

   ☐ I have no interest in this Site. I would not be interested in information about this Site.

   ☐ I have some interest. I would be interested in hearing or reading more about this Site.

   ☐ I am very interested. I would read information mailed to me and talk to people about this Site.

4. **What is the best way to provide you information about this Site? (check all that apply)**

   ☐ Newspaper notices What newspaper? _____

   ☐ Radio advertisements Which radio station? _____

   ☐ Community meeting Suggestions for locations? _____

   ☐ Fact Sheets/Newsletters

5. **What language would you like information provided in?**

   ☐ English ☐ Spanish ☐ Other _____

6. **Would you attend a meeting regarding this Site?**

   ☐ I would not attend a meeting.

   ☐ I might attend a meeting if it was convenient for me.

   ☐ I would attend a meeting.

7. **Can you suggest any other residents or community groups that we should speak to?**

   Name: _____

   Address: _____

   Telephone: _____

8. **We may need to talk with community members to learn more about the Site, would you be willing talk with us?**

   If so, please provide your contact information.

   ☐ Yes, please contact me. Telephone/Email: _____

   ☐ No, please do not contact me.

9. **Do you have any other comments, questions, or concerns you would like to add?**

   _____

   _____

   _____

10. **Please let us know if you would like to be added or removed from the mailing list for the Site:**

    ☐ Add my name to the mailing list.

    ☐ Delete my name from the mailing list.

    ☐ Correct my address as shown below.

    Name and Affiliation: _____

    Street Address: _____

    City, State, ZIP: _____

    E-mail address: _____

We appreciate the time you have taken to complete this survey. Please return the survey in the enclosed envelope by December 15, 2010. Postage has already been paid and you do not need to include a stamp. If you have questions or concerns regarding the Community Survey or the Site, please contact the following DTSC project staff:

Marcus Simpson
Public Participation Specialist
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200
(916) 255-6683 (toll free: 1-866-495-5651)
MSimpson@dtsc.ca.gov

Sam Martinez
Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200
(916) 255-6583
SMartin2@dtsc.ca.gov

** Please note that DTSC mailing lists are public records and may be released if requested.*

Community Survey Summary

The PG&E Sacramento Community Surveys were mailed out on November 29th, 2010, and were returned to DTSC by December 15, 2010. A total of 392 surveys were sent to various project stakeholders, including: Community residents and businesses within a ¼ mile radius of the Site, state, federal, and local elected officials, Sacramento city and County officials, and various media outlets. 34 community surveys were completed and returned, which is a return rate of approximately 8.7%, which indicates a high level of interest for the project. Typically, DTSC views a survey return rate of 3% to 5% normal. It should also be noted, that not all survey item responses will total 100%, since some respondents did not answer all items.

In general, Most respondents indicated they are at least familiar with the Site, but do not have specific details. Several of the respondents (50% to be exact) stated they have lived or worked in the area for 15 years or more, so we can conclude that many of the respondents are longstanding residents. In addition, most survey participants have at least *some* interest, and most stated they are very interested in the Site. In fact, 21 out of 34 survey participants stated they either might, or would, attend a community meeting about the project if one was held. A local community center (Southside Park Community Center) was identified by some respondents as a suitable and convenient meeting location.

The overwhelming majority of respondents indicated that receiving project information in English would be best, and 1 of 34 community respondents indicated Spanish would be the best language in which to receive project information. Lastly, about 35% of respondents stated it would be okay to contact them to discuss the Site and project with them, if needed, and 38% of survey participants stated, “please do not contact me”. However, most respondents (53%) did indicate they would like to be kept on the project mailing list to receive future details about the Site.

PG&E SACRAMENTO SITE
2000 Front Street, Sacramento, California 95818

Community Survey Questionnaire

1. **How long have you lived or worked in this area?**

   ☐ 0-5 years **32%** ☐ 5-10 years **0%** ☐ 10-15 years **18%** ☐ 15 or more years **50%**

2. **What is your current knowledge of the PG&E Sacramento Site?**

   ☐ I do not know anything about this Site. **47%**

   ☐ I have heard about this Site, but have little or no information on it. **53%**

   ☐ I know a lot about this Site. **0%**

3. **How interested are you in the PG&E Sacramento Site?**

   ☐ I do not know anything about this Site and cannot tell you if I am interested or not**. 9%**

   ☐ I have no interest in this Site. I would not be interested in information about this Site. **12%**

   ☐ I have some interest. I would be interested in hearing or reading more about this Site. **35%**

   ☐ I am very interested. I would read information mailed to me and talk to people about this Site. **44%**

4. **What is the best way to provide you information about this Site? (check all that apply)**

   ☐ Newspaper notices What newspaper? ___**44% (Sac Bee)**____

   ☐ Radio advertisements Which radio station? ___**18% (NPR)**_____

   ☐ Community meeting Suggestions for locations? __**29% (Local Community Centers)**

   ☐ Fact Sheets/Newsletters **53%**

5. **What language would you like information provided in?**

   ☐ English **97%** ☐ Spanish **3%** ☐ Other _____ **0%**

6. **Would you attend a meeting regarding this Site?**

   ☐ I would not attend a meeting. **35%**

   ☐ I might attend a meeting if it was convenient for me. **32%**

   ☐ I would attend a meeting. **29%**

7. **Can you suggest any other residents or community groups that we should speak to?**

   Name: _____

   Address: _____

   Telephone: _____

8. **We may need to talk with community members to learn more about the Site, would you be willing talk with us?**

   If so, please provide your contact information.

   ☐ Yes, please contact me. Telephone/Email: ____**35%**_____

   ☐ No, please do not contact me. **38%**

9. **Do you have any other comments, questions, or concerns you would like to add?**

   _____

   _____

   _____

10. **Please let us know if you would like to be added or removed from the mailing list for the Site:**

    ☐ Add my name to the mailing list. **53%**

    ☐ Delete my name from the mailing list. **21%**

    ☐ Correct my address as shown below.

    Name and Affiliation: _____

    Street Address: _____

    City, State, ZIP: _____

    E-mail address: _____

We appreciate the time you have taken to complete this survey. Please return the survey in the enclosed envelope by December 15, 2010. Postage has already been paid and you do not need to include a stamp. If you have questions or concerns regarding the Community Survey or the Site, please contact the following DTSC project staff:

Marcus Simpson
Public Participation Specialist
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200
(916) 255-6683 (toll free: 1-866-495-5651)
MSimpson@dtsc.ca.gov

Sam Martinez
Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200
(916) 255-6583
SMartin2@dtsc.ca.gov

** Please note that DTSC mailing lists are public records and may be released if requested.*

ARCADIS

Appendix C

Community Interview Questionnaire

PG&E Sacramento Site
Community Interview Questionnaire 2011

Date:	**Phone:**
Name:	**Email:**
Affiliation:	**Address:**

History:

1. How long have you lived or worked in the Sacramento Area?

2. Before meeting with us, what did you know about the PG&E Sacramento Site?

3. How interested are you in the Site and the cleanup activities? (no interest, some, very)

Concerns:

4. Do you have any specific concerns about this Site?

5. If so, which of your concerns are most important?

6. Do you know who to contact when/if you do have concerns about this Site?

Involvement:

7. Have you or others you know been actively involved with the Site in the past?

8. Have you ever received any information about this Site? If so, from where?

9. What additional information would you like to receive, if any?

10. How often would you like to be informed about updates and cleanup efforts at the Site?

11. Would you attend a community meeting about this Site?

Media:

12. Which newspapers, television stations, radio stations, or other sources do you generally use to receive news?

Level of Confidence:

13. Do you have confidence in the State and PG&E's ability to clean up this Site?

Communication:

14. Do you believe you have been kept adequately informed about this Site?

15. If not, what kinds of additional information would you like to receive?

16. What is the most effective way that we can distribute information to you and your community or constituents about the Site?

17. What languages are spoken in your home/neighborhood? If you do mailings to the community, what languages do you use in print?

18. Are there any other individuals or interest groups that you think we should contact?

19. Can you suggest a convenient location for community meetings?

20. Are there any other comments, suggestions, or concerns you would like to add?

Department of Toxic Substances Control

Leonard E. Robinson
Acting Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

PUBLIC PARTICIPATION PLAN
APPROVAL RECORD

Site Name: PG&E Sacramento Site
2000 Front Street
City of Sacramento
County of Sacramento
State of California

The undersigned have the Public Participation Plan prepared by ARCADIS on behalf of the Pacific Gas & Electric Company. The document is complete, acceptable and prepared in accordance with Departmental policies. This document is hereby approved.

Sam V. Martinez, P.E., Project Manager — Date: 4-19-2011

Marcus Simpson
Public Participation Specialist — Date: 4-19-11

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Appendix B

Administrative Record – Key Documents

Appendix B
Administrative Record – Key Documents List
Pacific Gas and Electric Company
Front and T Streets Site
Sacramento, California

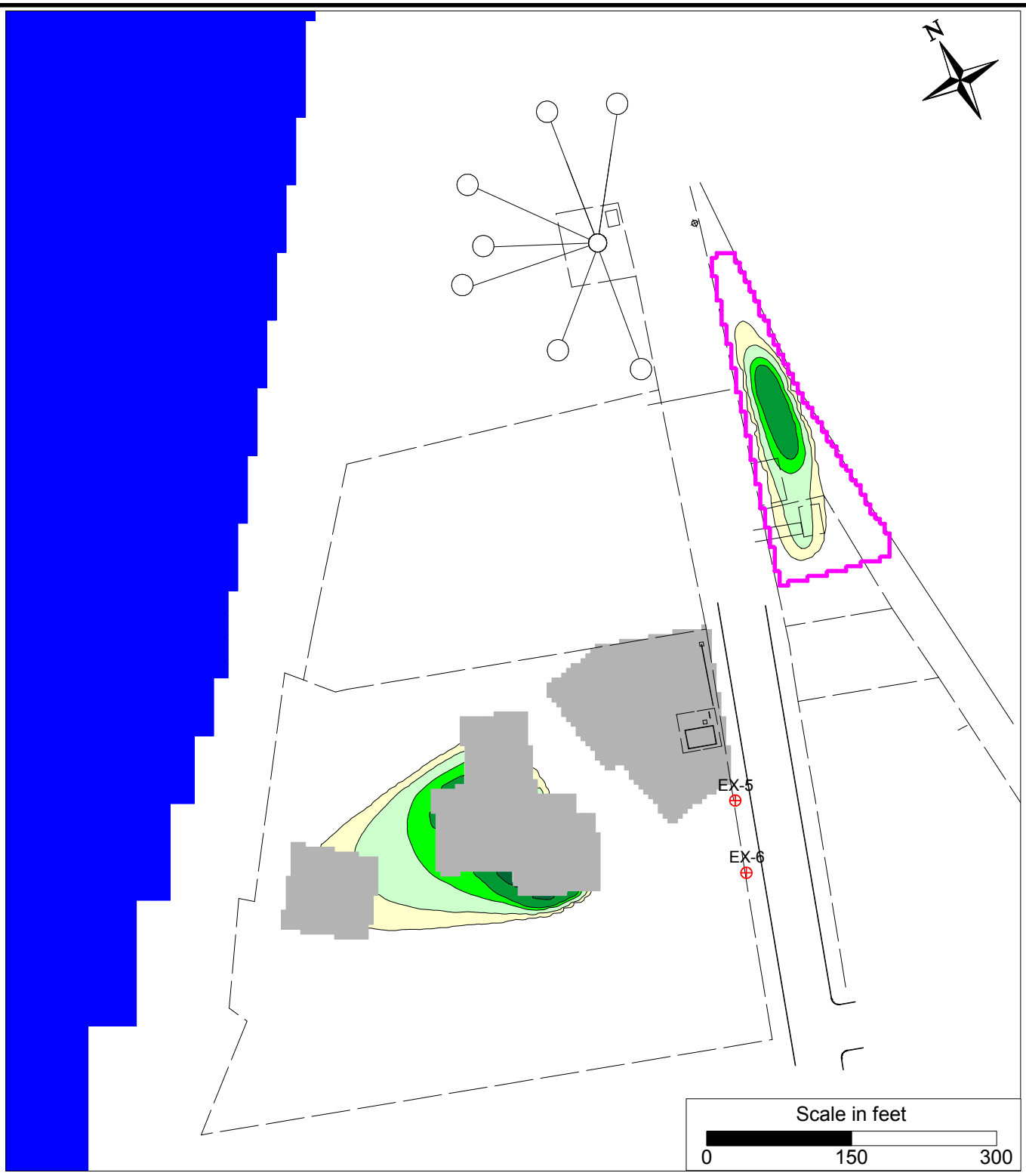
Date	Author	Title
May 1991	Tetra Tech	Final Remedial Action Plan
May 31, 1991	DTSC	Final Remedial Action Plan (Comments)
June 1992	Tetra Tech	Summary of Soil Remediation Activities at the Sacramento Former Manufactured Gas Plant Site
April 26, 1993	DTSC	Summary of Soil Remediation Activities (Comments)
May 12, 1993	PG&E	Summary of Soil Remediation Activities (Comments)
May 19, 1993		Covenant and Agreement to Restrict Use of Property (PG&E Parcel)
April 16, 1999	URS Greiner Woodward-Clyde	Excavation Closure Report, Caltrans and SMUD Front Street Site
June 30, 1999	DTSC	Excavation Closure Report, Caltrans and SMUD Front Street Site (Comments)
April 2001	Geomatrix	Final Groundwater Engineering Evaluation/Cost Analysis (EECA) and Remedial Action Work Plan (RAW)
April 27, 2001	DTSC	Final Groundwater EECA / RAW (Comments)
March 2002	Geomatrix	Soil Excavation Report
November 2002	Geomatrix	Additional Soil Excavation Report
December 19, 2002	DTSC	Soil Excavation Report and Additional Soil Excavation Report (Comments)
July 12, 2006		Covenant to Restrict Use of Property (Caltrans Parcel)
November 7, 2006		Covenant to Restrict Use of Property (SHRA Parcel)
November 17, 2006		Covenant to Restrict Use of Property (SMUD Parcel)
July 9, 2007	ARCADIS	Well Maintenance Plan and Cap Maintenance Plan
August 10, 2007	DTSC	Well Maintenance Plan and Cap Maintenance Plan (Comments)
October 23, 2007	DTSC	Operation & Maintenance Agreement
April 30, 2008	DTSC	Remedial Action Certification (Caltrans Parcel)
April 30, 2008	DTSC	Remedial Action Certification (SHRA Parcel)
April 30, 2008	DTSC	Remedial Action Certification (SMUD Parcel)
September 1, 2009	ARCADIS	Revised Supplemental Soil Investigation Completion Report
September 8, 2009	DTSC	Revised Supplemental Soil Investigation Completion Report (Comments)
November 19, 2009	ARCADIS	Soil Vapor Assessment Report and Vapor Intrusion Pathway Evaluation
December 8, 2009	DTSC	Soil Vapor Assessment Report and Vapor Intrusion Pathway Evaluation Report (Comments)
January 15, 2010	ARCADIS	2009 Annual Groundwater Monitoring Report
February 26, 2010	ARCADIS	Supplemental Soil and Groundwater Investigation Report
March 2, 2010	DTSC	2009 Annual Groundwater Monitoring Report (Comments)
March 16, 2010	DTSC	Supplemental Soil and Groundwater Investigation Report (Comments)
May 24, 2010	ARCADIS	Revised Soil Solidification/Stabilization Treatability Study Report
June 8, 2010	DTSC	Revised Soil Solidification/Stabilization Treatability Study Report (Comments)
June 30, 2010	ARCADIS	Groundwater Extraction & Treatment System Relocation and Extraction Well Installation Report
July 29, 2010	DTSC	Groundwater Extraction & Treatment System Relocation and Extraction Well Installation Report (Comments)
August 13, 2010	ARCADIS	Supplemental Soil and Groundwater Investigation Report
September 2, 2010	DTSC	Supplemental Soil and Groundwater Investigation Report (Comments)
January 15, 2011	ARCADIS	2010 Annual Groundwater Monitoring Report
March 1, 2011	ARCADIS	Addendum to Treatability Study – Revision 2 Memorandum
March 9, 2011	DTSC	Treatability Study Addendum (Comments)
April 15, 2011	DTSC	2010 Annual Groundwater Monitoring Report (Comments)

Copies of these documents are included on the attached compact disc
Caltrans = California Department of Transportation
DTSC = Department of Toxic Substances Control
PG&E = Pacific Gas and Electric
SHRA = Sacramento Housing and Redevelopment Agency
SMUD = Sacramento Municipal Utility District

ARCADIS

Appendix C

Groundwater Modeling Results



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Benzene Concentrations (ug/L)

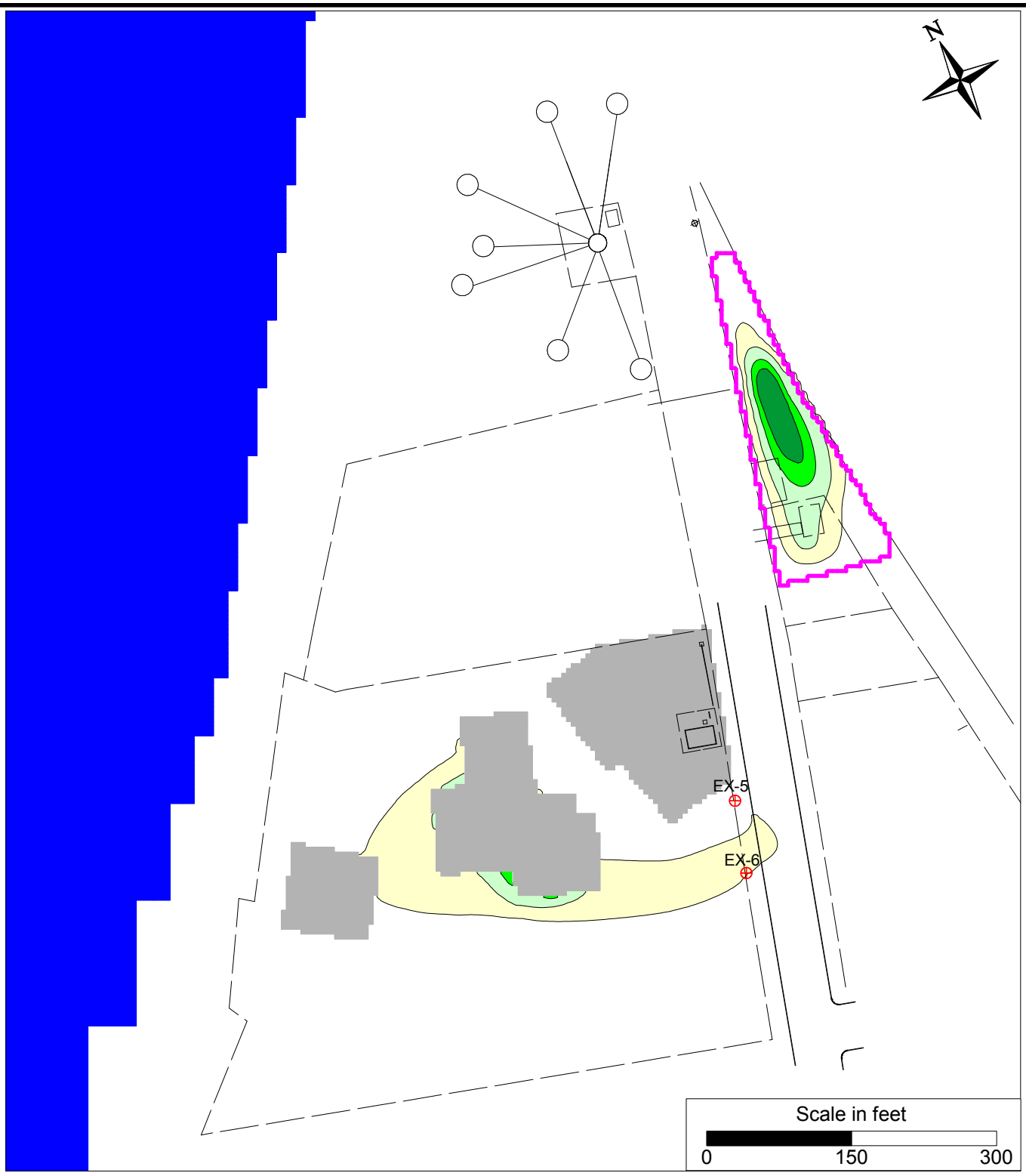
1 10 50 100 500

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

INITIALIZED BENZENE CONCENTRATIONS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	3



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Benzene Concentrations (ug/L)

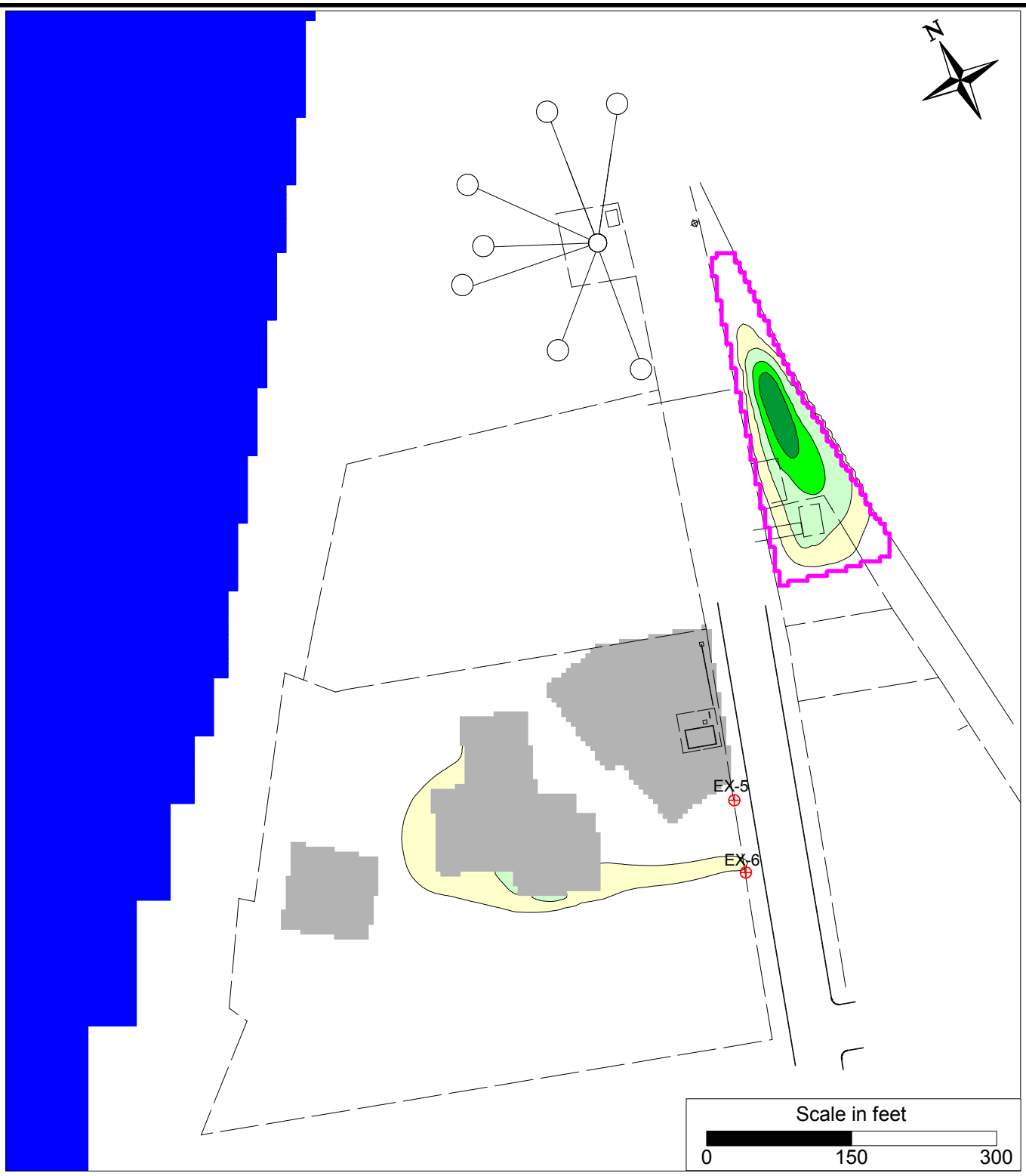
1 10 50 100 500

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED BENZENE CONCENTRATIONS AFTER 1 YEAR

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	4



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Benzene Concentrations (ug/L)

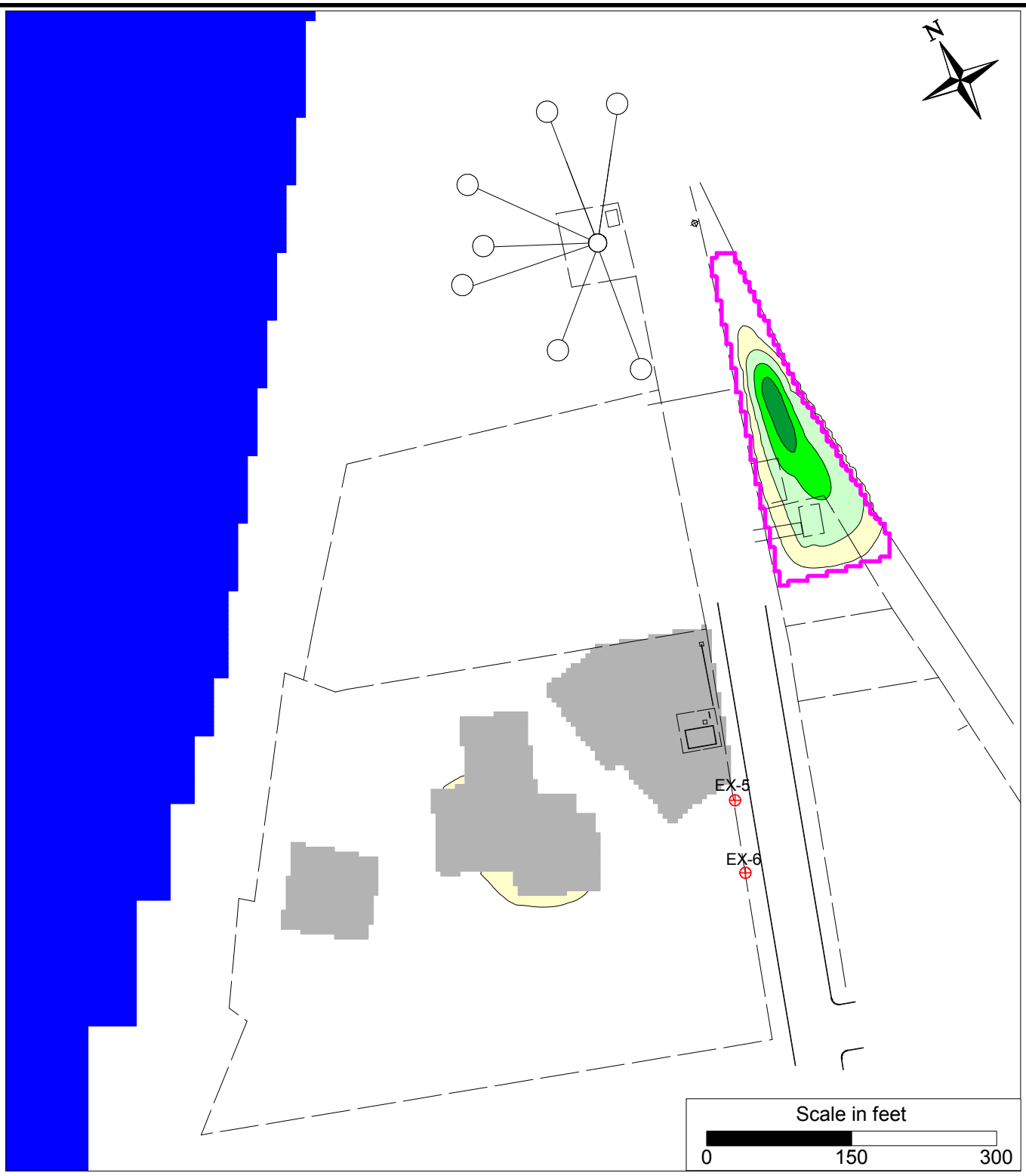
1 10 50 100 500

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED BENZENE CONCENTRATIONS AFTER 3 YEARS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	5



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Benzene Concentrations (ug/L)

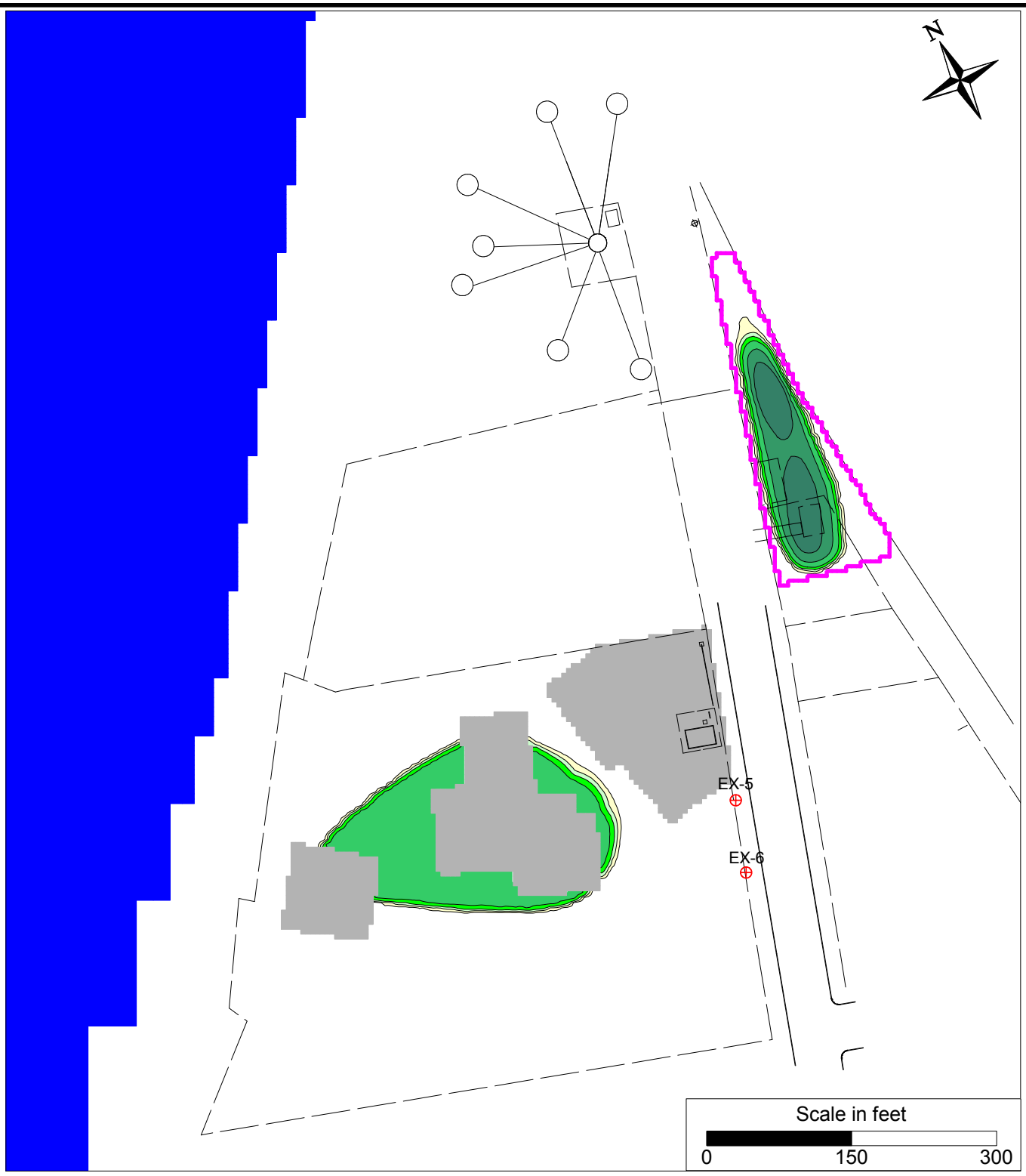
1 10 50 100 500

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED BENZENE CONCENTRATIONS AFTER 5 YEARS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	6



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Naphthalene Concentrations (ug/L)

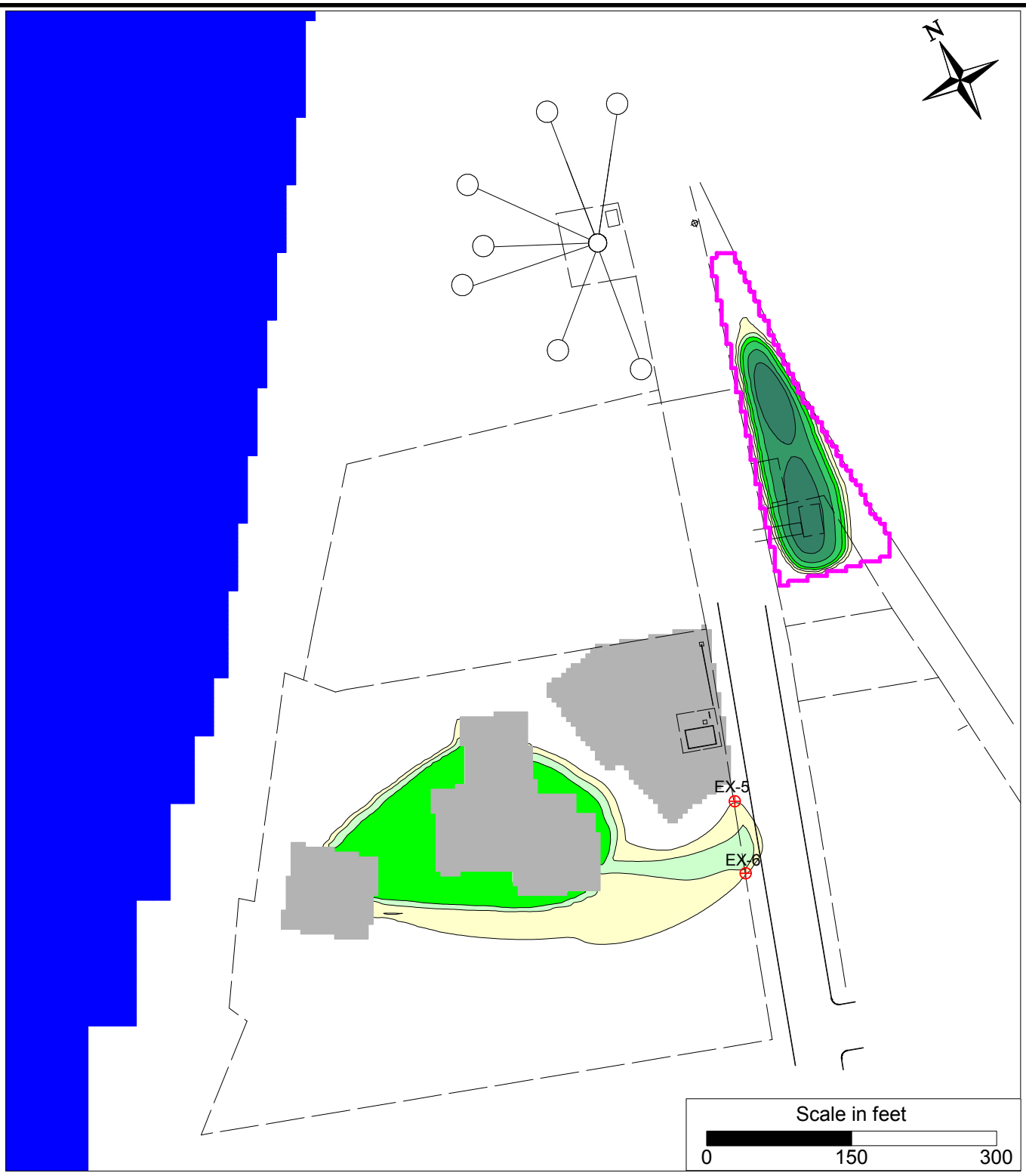
17 | 50 | 100 | 200 | 500 | 1,000 | 5,000

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

INITIALIZED NAPHTHALENE CONCENTRATIONS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	7



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Naphthalene Concentrations (ug/L)

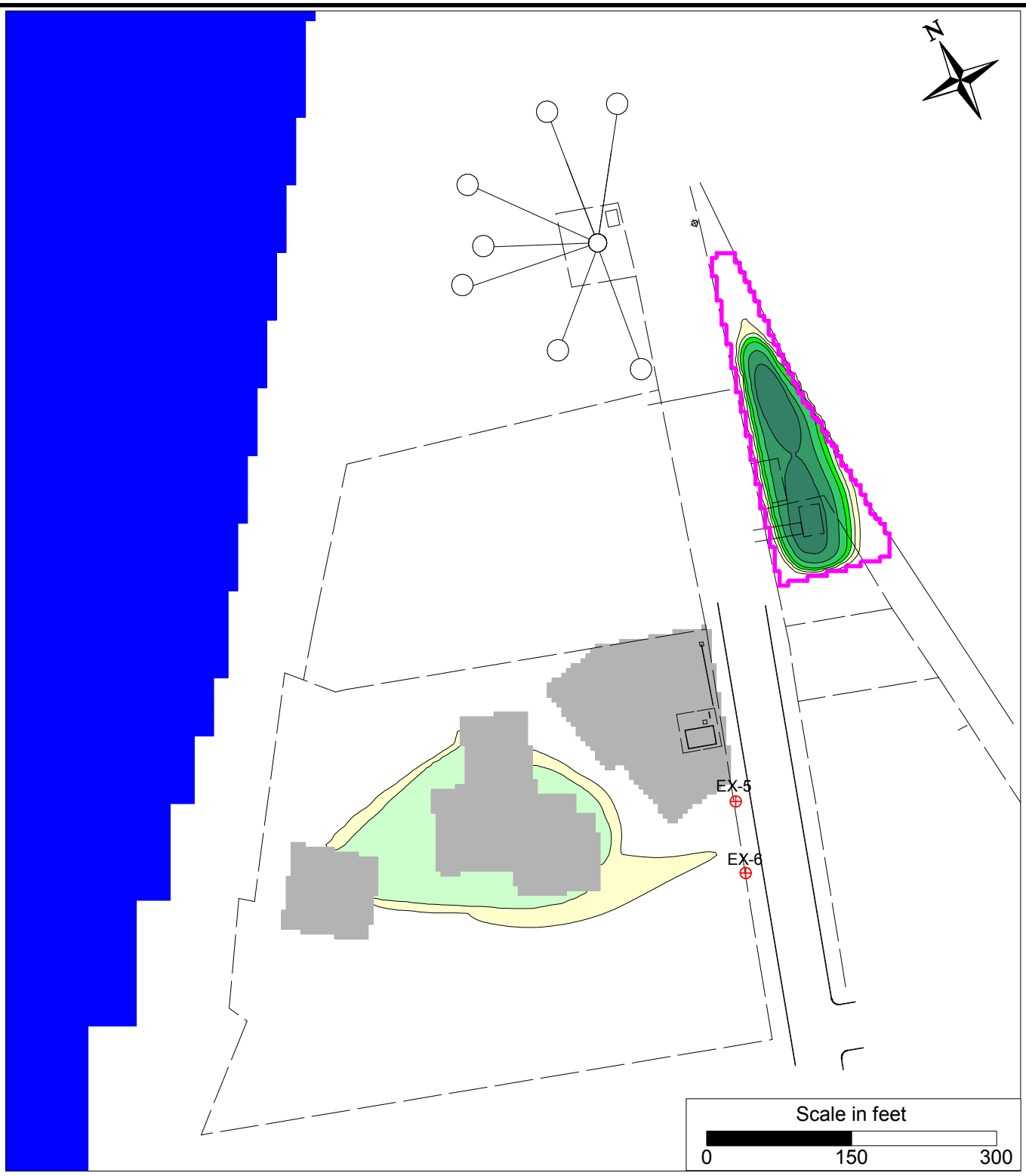
17 | 50 | 100 | 200 | 500 | 1,000 | 5,000

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED NAPHTHALENE CONCENTRATIONS AFTER 1 YEAR

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	8



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Naphthalene Concentrations (ug/L)

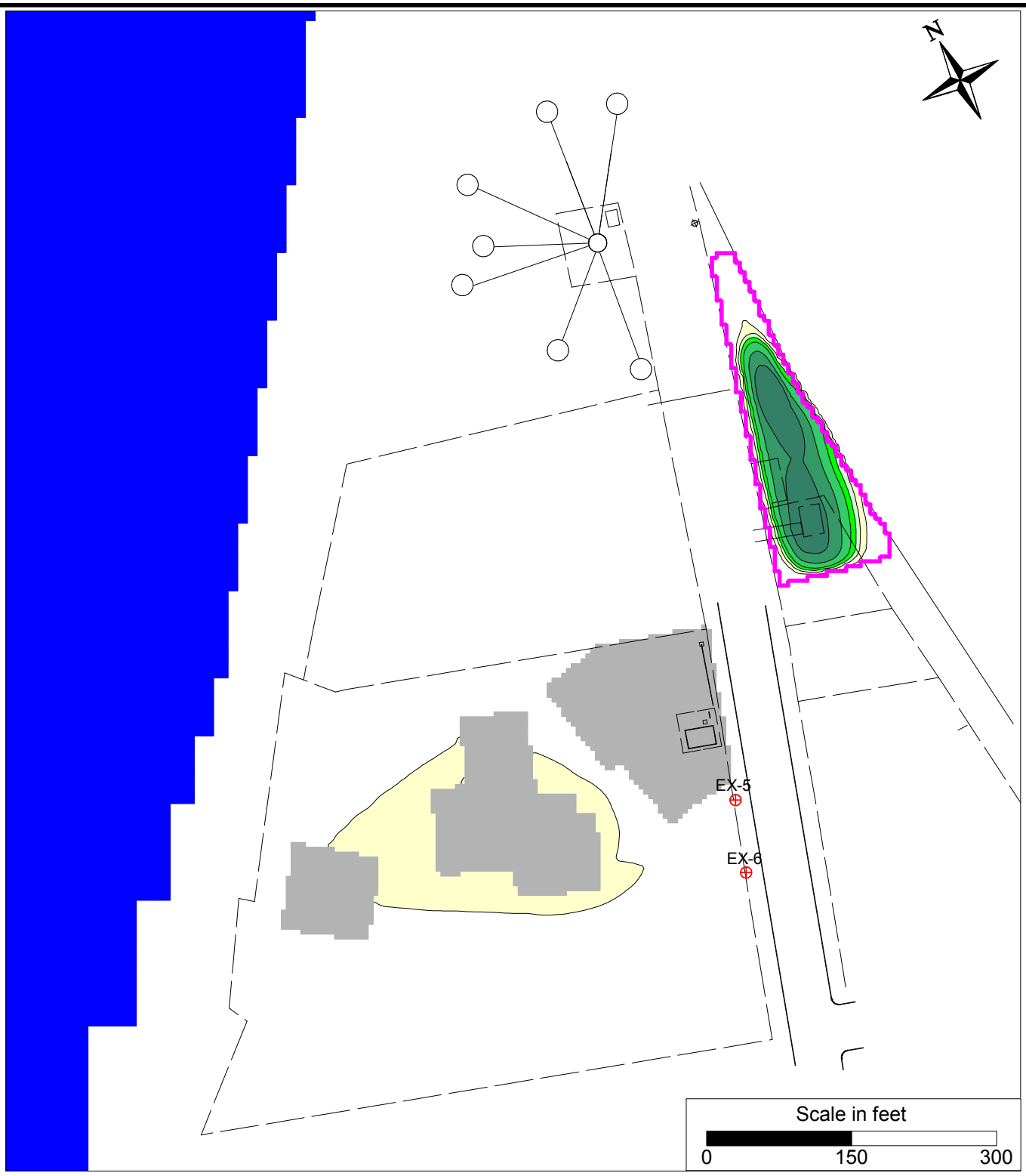
17 | 50 | 100 | 200 | 500 | 1,000 | 5,000

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED NAPHTHALENE CONCENTRATIONS AFTER 3 YEARS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	9



LEGEND

River Cell

No Flow Cell

Hydraulic Flow Barrier

Proposed Extraction Wells (12.5 gpm each)

Naphthalene Concentrations (ug/L)

17 | 50 | 100 | 200 | 500 | 1,000 | 5,000

ARCADIS
1114 Benfield Boulevard, Suite A
Millersville, MD 21108
Tel (410) 987-0032 Fax (410) 987-4392

SIMULATED NAPHTHALENE CONCENTRATIONS AFTER 5 YEARS

PG&E
SACRAMENTO, CALIFORNIA

PROJECT MANAGER	DEPARTMENT MANAGER
SP	MPK
DRAFTER	CHECKED
JWR	MPK
PROJECT NUMBER	DRAWING NUMBER
RC000661.009I	10

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Appendix D

ARARs and TBCs

Appendix D
ARARs and TBCs for Remedial Action Plan
PG&E Sacramento, Front and T Streets Site
Sacramento, California

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Groundwater				
Federal Regulatory Requirement	Safe Drinking Water Act [42USCA 300 and 40 CFR 141.11-141.16, 141.50-141.51](Relevant and appropriate, chemical-specific)	Relevant and Appropriate	Establishes drinking water standards to be met in the aquifer; establishes treatment standards for current potential drinking water sources by setting MCLs and non-zero MCLGs.	Drinking water standards will be considered in establishing cleanup levels for the Site.
State Regulatory Requirement	CDPH CCR Title 22 Cal. Safe Drinking Water Act [California Health and Safety Code Section 4010.1 et. seq., Title 22, CCR, Div. 4, Chapter. 15]	Relevant and Appropriate	Article 4 and Article 5.5 (section 64431 and 64444) of the CCR establish standards for inorganic and organic COCs in drinking water.	MCLs will be considered in establishing cleanup levels for the Site.
State Regulatory Requirement	Chapter 15, CCR, Title 23, Sections 2550.7, 2550.10	Relevant and Appropriate	Requires monitoring of the effectiveness of the remedial actions.	Contaminant concentrations in *in-situ* groundwater will be measured against the cleanup level.
State Regulatory Requirement	SWRCB Resolution 88-63	Applicable	Designates all ground and surface waters in the State as drinking water sources with specific exceptions.	Contaminant concentrations in groundwater at the point of compliance will be reduced over time to levels protective of beneficial uses.
Federal Regulatory Requirement	Groundwater Protection (40 CFR 264.90-264.101)	Relevant and Appropriate	Establishes the concentration limits, point of compliance, and corrective action requirements for solid waste management units.	Regulations will be consulted as part of the remediation and monitoring plan for the project.
Groundwater and Soil				
State Regulatory Standards	CCR Title 22, Division 4.5 Environmental Health Standards for the Management of Hazardous Waste	Relevant and Appropriate	Chapters 10 through Chapter 52 Sections 66001 through 69214 address the California hazardous waste management remediation and corrective action programs that will be in part relevant and appropriate to the clean-up efforts at the project site.	Develop revised cleanup levels, a remediation plan, and monitoring program to be consistent with the revised remedy.
State Regulatory Requirement	CCR Title 22, Division 4.5	Applicable	General requirements for the management of hazardous waste Chapters 10-51.	Comply with all relevant chapters that relate to the implementation of the remedial action.

Appendix D
ARARs and TBCs for Remedial Action Plan
PG&E Sacramento, Front and T Streets Site
Sacramento, California

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Requirement	Closure of Land Treatment Units 40 CFR 264.280	Relevant and Appropriate	Maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, minimize run-off of constituents, maintain run-on control system and run-off management system, control wind dispersal of hazardous waste, maintain unsaturated zone monitoring, establish vegetative cover, and establish background soil values to determine consistency with established values.	The remedial design will account for the immobilization of COCs currently entrained in the soil.
Federal Regulatory Guidance	Users guide for evaluating subsurface vapor intrusion in buildings prepared by Environmental Quality Management, Inc. Cedar Terrace Office Park, Suite 250 3325 Durham-Chapel Hill Boulevard Durham, North Carolina 27707-2646 for EPA. Revised 2004.	TBC	This guidance provides instructions on the use of the vapor transport model originally developed by P. Johnson and R. Ettinger in 1991 and subsequently modified by EPA in 1998, 2001, and again in November 2002.	Vapor intrusion assessment previously completed for the Site.
Federal Regulatory Guidance	Federal Register: November 29, 2002 Volume 67, Number 230 Page 71169-71172	Relevant and Appropriate	On November 29, 2002 EPA published Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils November 2002. EPA 530-D-02-004.	Vapor intrusion assessment previously completed for the Site.
Soil and Waste				
Federal Regulatory Requirement	RCRA, 40 CFR 268	Applicable	Land disposal restrictions apply to land disposal of listed or characteristic hazardous materials disposed off site, or excavated treated and disposed on site.	If off-site disposal of contaminated media is necessary, LDR requirements will be met.
Federal Guidance	Guidance for Caps	TBC	Evaluating Cover Systems for Solid and Hazardous Waste. (September 1982) EPA OSW-00-00-867	The cap will be removed and replaced in kind.
Federal Regulatory Requirement	40 CFR 262.34	Applicable	The exemption for ninety-day accumulation.	Waste materials will be stored at the site for less than 90 days.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Requirement	CCR, Title 27, Section 21090	Applicable	Requires a final cover constructed in accordance with specific prescriptive standards, to be maintained as long as wastes pose a threat to groundwater. Applies to wastes contained or left in place at the end of remedial actions that could affect water quality.	Comply with all relevant chapters that relate to the implementation of the remedial action.
State Regulatory Requirement	Title 22, CCR, Division 4.5, Chapter 14, Article 14	Relevant and Appropriate	Provides requirements for constructing and maintaining an onsite consolidation unit and for capping. Potentially applies to on-site consolidation or replacement and capping of waste after treatment.	Comply with all relevant chapters that relate to the implementation of the remedial action.
State Regulatory Requirement	California Health and Safety Code, Division 20, Chapter 6.5, CCR, Title 22, Division 4.5, Chapters 11 and 12: Minimum Standards for Management of Hazardous Wastes	Applicable	Controls hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal. Applies to any spent treatment material soils or waste that is disposed off site and determined to be hazardous.	Comply with all relevant chapters that relate to the implementation of the remedial action.
Surface Water or Storm Water				
Federal Regulatory Requirement	Federal Clean Water Act National Pollutant Discharge Elimination System (40 CFR Part 122-125)	Applicable	Requires permits for point-source discharges of pollutants to surface waters.	A NPDES General Permit will be obtained in compliance with CA SWRCB-DWQ Construction General Permit Order 2009-0009-DWQ.
State Regulatory Requirement	Central Valley Area Flood Control Agency Chapter 369 Assembly Bill No. 162.	Relevant and Appropriate	To control flooding along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with the USACE. A “levee protection zone” is an area that is protected, as determined by the CVFPB or the DWR, by a levee that is part of the facilities of the State Plan of Flood Control, as defined under Section 5096.805 of the Public Resources Code.	Consultation and oversight to ensure that the selected remedy does not impact the levee.
Federal Regulatory Requirement	Federal Clean Water Act regulations (40 CFR 110.3(b))	Applicable	Prohibits the discharge of oil that creates sheen in a stream.	The treatment of waste waters will comply with the sheen provisions of 40 CFR 110.3(b) if there is a discharge. It is planned to continue any treated groundwater discharge to the POTW.

Appendix D
ARARs and TBCs for Remedial Action Plan
PG&E Sacramento, Front and T Streets Site
Sacramento, California

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Guidance	California Storm Water Construction Hand Book	TBC	The California storm water quality association developed a handbook that provides advice and guidance on storm water management plans and practices during various construction activities in the state of California.	To ensure that BMPs are implemented during the project, this handbook will be consulted.
Federal Regulatory Requirement	NPDES General Permit for Storm Water Discharges from Construction Activities. 1987 WQA added Section 402(p) to the CWA requiring EPA to develop and implement a storm water permitting program. EPA developed this program in two phases (Phase I: 1990; Phase II: 1999). Those regulations establish NPDES permit requirements for municipal, industrial, and construction site storm water runoff.	Applicable	Construction activities (including land-disturbing activities) that disturb one acre or more are regulated under the NPDES storm water program. This general permit regulates construction-related activities, such as clearing, grading, excavation, and stockpiling. BMPs and appropriate monitoring ensure that storm water runoff does not exceed water quality standards.	A NPDES General Permit will be obtained in compliance with CA SWRCB-DWQ Construction General Permit Order 2009-0009-DWQ. All construction activities will be completed in accordance with permit requirements.
Federal Regulatory Guidance	Storm Water Pollution Prevention Plan for Construction EPA 833-R-06 - 008-May 2007	TBC	Guidance document for the management of surface water during construction projects.	This guidance document will be consulted for relevant and appropriate management practices for preventing pollution as a result of construction activities.
Federal Regulatory Requirement	40 CFR 264.251(c).(d) 40 CFR 264.273(c).(d) 40 CFR 264.301(c).(d)	Relevant and Appropriate	Prevent run-on and control and collect run-off from a 24-hour 25-year storm (waste piles, land treatment facilities, landfills).	The remedial design will account for surface water runoff for the site.
State Regulatory Requirement	California DWR	Relevant and Appropriate	Oversight of the stability of the levee system.	Consultation and oversight to ensure that the selected remedy does not impact the levee.
Federal Regulatory Requirement	40 CFR Parts 122, 123, 124, National Pollution Discharge Elimination System, implemented by California Storm Water Permit for Industrial Activities, State Water Resources Control Board Order #97-03-DWQ.	Applicable	Applies to storm water discharges from industrial areas; includes requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards.	The remedial design will include measures to minimize and/or eliminate pollutants in storm water discharges, and monitoring to demonstrate compliance.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Treated Groundwater				
Federal Regulatory Requirement	40 CFR 403.5 and local POTW regulations	Applicable	Discharge must comply with local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.	Discharge into the POTW as necessary.
Air				
State Regulatory Requirement	California Clean Air Act	Applicable	State Air Resources Board has adopted ambient air quality standards, based upon the recommendation of the State Department of Health Services, and that attainment of these health-based standards is necessary to protect public health.	The implementation of the selected remedy will include standard construction and earth-moving techniques that will minimize dust. These regulations will be consulted and complied with where necessary.
State Guidance	Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (DTSC 2004)	Relevant and Appropriate	The guidance document will be used in developing an assessment plan. The vapor intrusion pathway will be evaluated along with the exposure pathways identified in other guidance (PEA Guidance Manual, DTSC, reprinted 1998; Risk Assessment Guidance for Superfund (RAGS), Volume 1 Human Health Evaluation Manual, Part A, (EPA 1989).	Vapor intrusion assessment completed. Supplemental assessment recommended following implementation of additional remedial action.
Federal Regulatory Requirement	RCRA, 40 CFR 264 Subpart BB	Relevant and Appropriate	These regulations govern the air emission standards for equipment.	While air releases are not anticipated, equipment may be used on site that could develop a leak or otherwise cause a release. These regulations will be consulted in the event of an equipment leak.
OSHA				
Federal Regulatory Requirement	29 CFR 1910.120	Applicable	OSHA requirements for workers engaged in response or other hazardous waste operations	OSHA requirements will be incorporated in the Health and Safety Plan.
Federal Regulatory Requirement	29 CFR Part 1910	Applicable	Occupational Safety and Health Standards (General Industry Standards)	OSHA standards will be incorporated in the Health and Safety Plan.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
CULTURAL AND BIOLOGICAL RESOURCES				
State Regulatory Guidance	Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (CDFG May 31, 2000) Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California (CDFG 1994) The Swainson's hawk (Buteo swainsoni) is listed as a California state threatened species under CESA. (CEQA Guidelines §21081). CEQA, Warren-Alquist Act and implementing regulations, and CESA require consideration of direct, indirect, temporary, permanent, individual project, and cumulative impacts	TBC	Nesting Swainson's Hawk Habitat: Include mitigation measures to prevent a potential loss of nesting and foraging habitat for special status species in the area of the site. To meet the minimum level of protection for the species, surveys, if required, will be completed for **at least** the two survey periods immediately prior to a project's initiation. Surveys will be focused on both observations and vocalizations. Observations of nests, perched adults, displaying adults, and chicks during the nesting season are all indicators of nesting Swainson's hawks.	If construction occurs during the breeding season (February 1-August 31), conduct CDFG recommended protocol-level surveys prior to construction as required by the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley or as required by the CDFG in the future. If active nests are found in the construction area, mitigation measures consistent with the Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California shall be incorporated in the following manner or as directed by CDFG: 1) If an active nest is found, no intensive new disturbances (e.g., heavy equipment operation associated with construction, use of cranes or draglines, new rock crushing activities) or other project-related activities that may cause nest abandonment or forced fledging, can be initiated within 200 yards (buffer zone) of an active nest between March 1 and September 15. The size of the buffer area may be adjusted if a qualified biologist and CDFG determine it would not be likely to have adverse effects on the hawks. No project activity shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active. 2) Nest trees shall not be removed unless there is no feasible way of avoiding removal of the tree. If a nest tree must be removed, a Management Authorization (including conditions to offset the loss of the nest tree) must be obtained from CDFG with the tree removal period specified in the management Authorization, generally between October 1 and February 1. 3) If construction or other project-related activities that may cause nest abandonment or forced fledging are necessary within the buffer zone, monitoring of the nest site (funded by the project proponent) by a qualified biologist will be required to determine if the nest is abandoned. If the nest is abandoned and if the nestlings are still alive, fund the recovery and hacking (controlled release of captive reared young) of the nestling(s). 4) Routine disturbances, such as routine maintenance activities within 0.25 mile of an active nest, shall not be prohibited.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State and Federal Regulatory Guidance	CDFG regulations concerning birds (Sections 3503 and 3513) United States Code Title 16, Chapter 7, Subchapter II, the Migratory Bird Treaty Act of 1918	Relevant and Appropriate	Nesting habitat for other protected or sensitive avian species: Include mitigation measures to prevent a potential loss of nesting and foraging habitat for special status species in the area of the site.	1) Vegetation removal and construction shall occur after between September 1 and January 31 whenever feasible. 2) Prior to any construction or vegetation removal between February 1 and August 31, a nesting survey shall be conducted by a qualified biologist of all habitat within 500 feet of the construction area. Surveys shall be conducted no less than 14 days and no more than 30 days prior to commencement of construction activities and surveys will be conducted in accordance with CDFG protocol as applicable. If no active nests are identified on or within 500 feet of the construction site, no further mitigation is necessary. This survey can be carried out concurrently with surveys for other species provided it does not conflict with any established survey protocols. If an active nest of a sensitive species is identified onsite (per established thresholds), specific mitigation measures shall be developed in consultation with CDFG and USFWS. At a minimum, these measures shall include a 500-foot no-work buffer that shall be maintained between the nest and construction activity until CDFG and/or USFWS approves of any other mitigation measures. 3) Completion of the nesting cycle shall be determined by qualified ornithologist or biologist.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State and Federal Regulatory Guidance	California Burrowing Owl Consortium's April 1995 Burrowing Owl Survey Protocol and Mitigation Guidelines (CDFG April 1995) CDFG regulations concerning birds (Sections 3503 and 3513) United States Code Title 16, Chapter 7, Subchapter II, the Migratory Bird Treaty Act of 1918 CEQA The burrowing owl is protected by international treaty under the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711) and under Sections 3503 and 3800 of the California Fish and Game Code (CFGC). Sections 3503, 3503.5, and 3800 of the CFGC	Relevant and Appropriate	Burrowing Owl Nesting Habitat: Include mitigation measures to prevent a potential loss of nesting and foraging habitat for special status species in the area of the site. Priority survey areas of the facility site; Burrowing owls prefer open areas with short vegetation that allow visibility of approaching predators (Zarn 1974) or contain elevated perches for the same purpose (Green 1983). Low-growing vegetation may also provide hiding sites for young owls (MacCracken et al. 1985) and increase hunting efficiency (Johnsgard 1988) The CDFG recommends following the California Burrowing Owl Consortium survey methods (CBOC 1993) to establish the status of burrowing owl on the Project site and to provide for a CEQA baseline. The CEQA impact assessment and "take" avoidance should follow the Department's staff report recommendations (CDFG 1995).	1) Prior to construction activity, focused pre-construction surveys shall be conducted for burrowing owls where suitable habitat is present within the construction areas. Surveys shall be conducted no less than 14 days and no more than 30 days prior to commencement of construction activities and surveys shall be conducted in accordance with CDFG burrowing owl survey protocol. 2) If unoccupied burrows are found during the non-breeding season, the project applicant may collapse the unoccupied burrows, or otherwise obstruct their entrances to prevent owls from entering and nesting in the burrows. This measure would prevent inadvertent impacts during construction activities. 3) If no occupied burrows are found in the survey area, a letter report documenting survey methods and findings shall be submitted to CDFG, and no further mitigation is necessary. If occupied burrows are found, impacts on the burrows shall be avoided by providing a buffer of 165 feet during the non-breeding season (September 1 through January 31) or 250 feet during the breeding season (February 1 through August 31). The size of the buffer area may be adjusted if a qualified biologist and CDFG determine it would not be likely to have adverse effects on the owls. No project activity shall commence within the buffer area until a qualified biologist confirms that the burrow is no longer occupied. If the burrow is occupied by a nesting pair, a minimum of 7.5 acres of foraging habitat contiguous to the burrow shall be maintained until the breeding season is over. 4) If impacts on occupied burrows are unavoidable, onsite passive relocation techniques approved by CDFG shall be used to encourage owls to move to alternative burrows outside of the impact area. However, no occupied burrows shall be disturbed during the nesting season unless a qualified biologist verifies through non-invasive methods that juveniles from the occupied burrows are foraging independently and are capable of independent survival. Mitigation for foraging habitat for relocated pairs shall follow guidelines provided in the California Burrowing Owl Consortium's April 1995 Burrowing Owl Survey Protocol and Mitigation Guidelines, which ranges from 7.5 to 19.5 acres per pair.

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Guidance	California Statewide Historic Preservation Plan (OHP) California State Law and Historic Preservation, a publication of the State Office of Historic Preservation (OHP), is a compilation of state statutes and regulations that govern the identification, designation and protection of the State of California's significant historical resources. The primary purpose of this Comprehensive Statewide Historic Preservation Plan (State Plan) is to provide guidance to OHP and the preservation community for the identification, registration, protection, and preservation of important historic resources.	TBC	Include mitigation measures to prevent the loss or degradation of known or undiscovered prehistoric and historic resources. An archeological site may be considered an historical resource if it is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military or cultural annals of California (PRC Section 5020.1(j)) or if it meets the criteria for listing on the California Register (14 CCR Section 4850). If an archeological site is an historical resource (i.e., listed or eligible for listing in the California Register) potential adverse impacts to it must be considered, just as for any other historical resource (PRC Sections 21084.1 and 21083.2(l)).	Prior to any site specific implementation, that could include subsurface disturbance, a detailed archaeological research design shall be prepared that identifies past land use (including geological history, preparation of historic context), assesses the potential of encountering significant deposits based on the past use, provides research themes and questions relevant to types of land use (industrial, commercial, residential, etc.), and identified features, components, and materials necessary to address ongoing research themes. If the research design concludes that there is a high potential within a specific project site to encounter significant deposits, then a test excavation and data recovery plan shall be prepared and implemented prior to any grading, excavation, or construction on the property.
State Regulatory Guidance	California Statewide Historic Preservation Plan (OHP)	TBC	Include mitigation measures to prevent the loss or degradation of known or undiscovered prehistoric and historic resources.	A qualified archaeologist shall train the construction crew to identify cultural artifacts and human remains, if no qualified archaeologist is to remain as an onsite monitor during all excavation.
State Regulatory Guidance	California Statewide Historic Preservation Plan (OHP) Section 15064.5. Determining the Significance of Impacts to Archeological and Historical Resources.(CEQA guidelines Title 14 Chapter 3	TBC	Include mitigation measures to prevent the loss or degradation of known or undiscovered prehistoric and historic resources.	If cultural materials — not assessed or excavated prior to construction — are discovered during construction, all earth-moving activity within and around the immediate discovery area shall be diverted until a qualified archaeologist can assess the nature and significance of the find.

Appendix D
ARARs and TBCs for Remedial Action Plan
PG&E Sacramento, Front and T Streets Site
Sacramento, California

AUTHORITY	REQUIREMENT	STATUS	SYNOPSIS OF REQUIREMENT	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Guidance	California Statewide Historic Preservation Plan (OHP) Section 15064.5. Determining the Significance of Impacts to Archeological and Historical Resources.(CEQA guidelines Title 14 Chapter 3 California Public Resources Code "5020.4 (a) (2) and 5024.6 (n).	TBC	Include mitigation measures to prevent the loss or degradation of known or undiscovered prehistoric and historic resources. The California State Historical Resources Commission (SHRC) directs the State Historic Preservation Officer (SHPO) to maintain an inventory of historical resources in California.	If significant sites are found on the property during grading, excavation, or construction, then a qualified archaeologist shall prepare a report on findings and transmit the report to NCIC, OHP, the City's Preservation Office, and the SAMCC. If the site is determined to be historic, the qualified archaeologist shall prepare recommendations for the City's Preservation Director, and the City's History and Science Manager for an on-site interpretive exhibit of the artifacts and the site and the ultimate disposition of the artifacts. If the site is determined to be prehistoric, the representative from the NAHC and the MLD shall be contacted.
State Regulatory Requirement	State Health and Safety Code Section 7050.5; PRC Section 5097.98	Relevant and Appropriate	Include mitigation measures to prevent the loss or degradation of known or undiscovered prehistoric and historic resources.	If human remains are discovered, State Health and Safety Code Section 7050.5 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains and the County Coroner will be contacted. Pursuant to PRC Section 5097.98, if the remains are thought to be Native American, the coroner will notify the NAHC who will then notify the MLD. At this time, the person who discovered the remains will contact the City so that they may work with the MLD on the respectful treatment and disposition of the remains. Further provisions of PRC 5097.98 are to be followed as applicable.

Notes:

ARAR – Applicable or Relevant and Appropriate Requirement
BMP – Best Management Practice
BTEX – Benzene, Toluene, Ethylbenzene, and Total Xylenes
CA SWRCB-DWQ – California State Water Resources Control Boards Division of Water Quality
CCR – California Code of Regulations
CDFG – California Department of Fish and Game
CDPH – California Department of Public Health
CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CFR – Code of Federal Regulations
COC – Contaminant of Concern
CVFPB – Central Valley Flood Protection Board
CWA – Clean Water Act
DTSC – Department of Toxic Substances Control
DWR – California Department of Water Resources
EPA – U.S. Environmental Protection Agency
LDR – Land Disposal Restriction
MCL – Maximum Contaminant Level
MCLG – Maximum Contaminant Level Goal
MLD – Most Likely Descendent
NA – Not Applicable
NAHC – Native American Heritage Commission
NCIC – National Crime Information Center
NPDES – National Pollutant Discharge Elimination System
OHP – California Department of Parks and Recreation, Office of Historic Prevention
OSHA – Occupational Safety and Health Administration
PAH – Polynuclear Aromatic Hydrocarbon
PEA – Preliminary Endangerment Assessment
POTW – Publically Owned Treatment Works
PRC – California Public Resources Code
RAOs – Remedial Action Objectives
RCRA – Resource Conservation and Recovery Act
SAMCC - Sacramento Archives and Museum Collection Center
SWRCB – State Water Resources Control Board
SDWA – Safe Drinking Water Act
TBC – Directives to Be Considered
TCLP – Toxicity Characteristic Leaching Procedure
TSD – Treatment, Storage, and Disposal
USACE – United States Army Corps of Engineers
USFWS – United States Fish and Wildlife Service
USC – United States Code
WQA – Water Quality Act
WQS – Water Quality Standard

ARCADIS

Appendix E

Alternative Remedial Solutions

Appendix E
Alternative Remedial Solutions

The current approved remedy for groundwater remediation at the Site is based on the assumption that Remedial Action Objectives (RAOs) will be achieved with the combination of previous and ongoing engineered remediation efforts (the groundwater extraction and treatment system (GWETS), soil vapor extraction and treatment system (SVETS), and soil excavation) and intrinsic biodegradation (Geomatrix 2001). Hydraulic conditions at the Site have changed following the shutdown of the Ranney Collector in 2009, necessitating a re-evaluation of the groundwater remedial strategy at the Site. Additionally, the current approved remedy does not include a time frame or strategy for shut down of the GWETS.

1. Previous Feasibility Studies

Various feasibility studies for the Site have previously been issued. In 1991 Tetra Tech Inc., issued a *Final Remedial Action Plan* (Tetra Tech 1991) for the PG&E parcel; in 2001; Geomatrix Consultants, Inc. issued a *Final Groundwater EE/CA and RAW* (Geomatrix 2001); and in 2007 ARCADIS issued a *Focused Feasibility Study* for the Site (ARCADIS 2007a).

In 1991, Tetra Tech prepared a draft RAP that proposed: excavation of chemically-affected soil above the water table (from 14 to 21 feet bgs); and offsite disposal of this soil; backfilling of the excavation with clean imported fill; installation of a low-permeable cap (to prevent human exposure to residual contaminated soil and to minimize infiltration of rain water into the subsurface); and installation of a groundwater extraction and treatment system. The 1991 RAP presented three similar groundwater remedies: a carbon adsorption system; a packed air stripping system; and a direct discharge system. Following the adoption of a final RAP, excavation was completed in 1991 and a cap installed in 1995. In 1995, a carbon adsorption system which is generally referred to as the GWETS was constructed. The GWETS addresses chemically-affected groundwater as intended in the 1991 RAP.

In 1991, the following technologies were rejected for soil remediation:

- Bioremediation, because it was unproven in the remediation of five- and six-ringed polycyclic aromatic hydrocarbons (PAHs);
- Thermal treatment, due to difficulty in obtaining permits, high cost, and potential health risks associated with emissions, and due to their experimental nature;
- *In-situ* vitrification, due to high costs and technical difficulties in capturing off-gases;
- Soil vapor extraction, because it would be ineffective at treating PAHs;
- Soil stabilization, because Tetra Tech was of the opinion that, near the levee, it might compromise the integrity of the levee.

Since issuance of the Tetra Tech document, thermal technologies have matured, are no longer experimental, and are considered a standard NAPL source zone treatment technology that can be

implemented safely. In addition, with the right grout mix, soil stabilization can be implemented in a manner that would not compromise the stability of the levee or other structural components.

At the time that the Geomatrix document (Geomatrix 2001) was written, the GWETS was operating on the PG&E property, and the SVE system (installed in 1999) was operating on the Caltrans and SMUD properties. Geomatrix reviewed the then current remedial strategy and concluded that protection of human health and the environment was being achieved and additional groundwater remediation was not necessary. The proposed remedy for groundwater remediation was: intrinsic biodegradation of the adsorbed and dissolved COCs through MNA; continued operation of the Ranney Collector, the GWETS located on the PG&E parcel, and the SVE system located on the Caltrans and SMUD properties; maintenance of the cap on the PG&E parcel; and maintenance of land use covenants. This remedy was approved by the DTSC and the RWQCB on April 27, 2001.

In 2006, ARCADIS shut down the SVE system due to declining contaminant recovery. In 2007, ARCADIS re-evaluated the approved remedy in anticipation of the planned shutdown of the Ranney Collector in 2009. A review of the GWETS data suggested that mass removal rates were low, so a rebound study was designed to see whether the GWETS was really needed or whether natural degradation was sufficiently controlling the plume. At that time, it was understood that the majority of residual contaminant mass on the PG&E parcel was located in the center of the parcel. ARCADIS presented a proposal for a rebound study that was implemented between May and October 2007. Following GWETS shutdown, COC concentrations rebounded in several downgradient wells. Based on these data, the rebound study was curtailed, and the GWETS was restarted.

As reported in the 2007 *Focused Feasibility Study*, ARCADIS considered expanding the GWETS and enhancing *in-situ* biodegradation of the more soluble COCs via oxygen injection. It was concluded, however, that enhanced *in-situ* biodegradation would be unlikely to significantly reduce the amount of time to reach RAOs.

There is currently a deed restriction on the PG&E parcel that prevents it from being used for residential purposes and also specifies that the current surface cap be maintained in perpetuity. Whichever remedial solution is chosen to enhance the current groundwater remediation strategy, it is anticipated that a LUC will be required as part of that strategy. The current deed restriction does not address vapor mitigation using engineering controls.

2. Technology Identification and Screening

Various technologies to enhance the current groundwater remediation strategy were identified and evaluated. The technologies selected for evaluation were those that could minimize, stabilize, and/or control remaining onsite residual mass sufficiently so that:

- Residual contaminant mass left in the soil no longer provides a significant source of chemicals to groundwater or a source of vapors to indoor air;

- Dissolved-phase COCs degrade via natural processes reducing both the onsite and offsite extent of groundwater impacts; and

- Groundwater cleanup levels can be achieved in a reasonable timeframe (on the order of five years) without ongoing active remediation.

The current remedy, which includes GWETS operation, is a source control approach. While the existing remedy protects human health and the environment, it will require perpetual O&M because it relies on the transfer of COC mass from the soil to groundwater through dissolution which is a slow process. To reduce the overall timeframe required for active remediation, the residual mass of COCs to groundwater must be addressed. Appropriate technologies to address the residual mass of COCs include the following:

- Removal –
  - Soil excavation and either onsite treatment or offsite disposal at an appropriately licensed landfill.
  - Expansion of the existing GWETS to increase the quantity of water extracted, and therefore the mass of COCs removed.
  - Enhanced dissolution of COC mass into groundwater through the injection of a surfactant or co-solvent, combined with either GWETS or *in-situ* oxidation of COCs dissolved into groundwater.
  - Thermal treatment technologies whereby water and COCs are volatilized by the application of heat to the subsurface. Several different technologies exist including *in-situ* thermal desorption (ISTD) and electrical resistance heating (ERH), generally applied to treat low-permeable soils, and steam enhanced extraction (SEE), generally used to treat high permeable soils. Once the COCs are volatilized they are extracted using vacuum-extraction techniques and treated above ground.
  - *In-situ* aerobic biodegradation of contaminants in groundwater stimulated through the delivery of air or pure oxygen to the subsurface.
- Containment –
  - Construction of a subsurface barrier to enclose the COC mass and divert groundwater flow around the mass to minimize groundwater contact. Subsurface barriers can be constructed using slurry-wall construction techniques or driven sheet-piles.
  - Reduce the solubility of COCs by chemically binding them in-situ (e.g., in-situ soil stabilization / solidification [ISSS]) whereby stabilizing agents (usually cement) are mixed into the soil, decreasing the leachability of the COCs and the permeability of the COC affected soils.
- Institutional Controls -
  - Institutional controls include deed restrictions and LUCs that restrict the ultimate use of a property. As described in the RAP, an LUC is in place for the PG&E parcel that controls how the property can be used and specifies that DTSC must be notified prior to any change of property ownership.

Some form of institutional control will be required at this Site irrespective of which remedial alternative is selected. Institutional controls are carried forward to the alternative development phase of the project without further evaluation. All other remedial technologies were evaluated based on the criteria of effectiveness, implementability, and cost. A description of the evaluation is presented in the following sections and summarized in Table E-1.

2.1 Effectiveness

Each technology was screened for effectiveness based on its potential to achieve the RAOs.

Use of a surfactant or co-solvent to increase COC dissolution into groundwater is expected to have low effectiveness at this Site because it will be difficult to distribute in the low-permeability soils where high concentrations of COCs reside. Aerobic bioremediation and GWETs solutions are an effective means of treating COCs dissolved in groundwater, but they are not effective methods for reducing non-aqueous COC residual mass in a reasonable time frame.

Excavation, a physical barrier, ISSS, and *in-situ* thermal treatment are the technologies most likely to be effective at this Site. Excavation would permanently remove residual mass by physical removal, and the containment options (physical barrier and ISSS) would isolate COC residual mass from groundwater. An ISSS mix design has been developed based on the results of bench-scale testing that controls the leachability of COCs from Site soils above the cleanup levels (ARCADIS 2010c). A combination of thermal treatment technologies would also be an effective means of removing COC mass in both the high and low permeability soils at the Site.

2.2 Implementability

Each technology was screened for implementability based on site geology and hydrogeology, availability of necessary components, and the ease of construction.

The majority of the remaining COC mass lies below the water table. A significant amount of dewatering would be required in order to remove it increasing the complexity of an excavation effort. In order to address COC mass in both the high and low permeable soils at the Site, a combination of *in-situ* thermal technologies would be required adding to the complexity of the implementation. Additionally, *in-situ* thermal technologies require the evaporation of moisture from the soil to be effective. At this Site, with the high permeable soils of Unit 3 and the high groundwater flow rates, a subsurface barrier would likely be required to keep water out of the treatment area. The enclosed area would have to be continually dewatered. Implementation of this solution would be extremely difficult.

Use of a surfactant or co-solvent would be relatively easy to implement at this Site. Implementation would only be complicated by the high density of injection wells that would be required to address the low permeability soils at this Site.

Upgrading of the GWETS system currently operating at the Site would be relatively easy to implement. Mass removal rates and well spacing could be accurately estimated based on historical data, and the required construction techniques are well established.

The containment options (physical barrier and ISSS) would also be relatively easy to implement using well established construction techniques.

2.3 Cost

Each technology was screened for cost. Excavation implementation costs would be extremely high but maintenance costs would be low. *In-situ* thermal treatment technologies implementation costs would also be extremely high because of the complexity of the implementability. Implementation costs of a surfactant/co-solvent solution would be relatively high because of the large number of wells that would be required and the period of operation that would be required to meet RAOs. ISSS implementation costs would be relatively

high but maintenance costs would be limited. Installation of a physical barrier would be moderately expensive and maintenance costs would be limited. Aerobic bioremediation would also be relatively low in cost to implement.

2.4 Technologies Retained for Further Consideration

Technologies that are likely to be effective and that would be relatively easy to moderately complicated to implement were retained for further consideration. The technologies retained for further consideration are as follows:

- Operation of the current GWETS as the “no-action” option
- Expanded GWETS
- Subsurface Physical Barrier
- ISSS

3. Remedial Action Alternatives

A more detailed description for each of the four alternatives carried forward from the screening phase is presented below.

3.1 No Action – Continued Operation of the GWETS

The currently approved remedy for groundwater remediation is intrinsic biodegradation through MNA along with continued operation of the GWETS, maintenance of the PG&E parcel surface cap, hydraulic containment by the Ranney Collector (Geomatrix 2001), implementation of a groundwater monitoring program, and maintenance of an LUC. Operation of the SVETS has been discontinued, and the Ranney Collector was shut down in 2009. Hydraulic conditions at the Site have changed following the shutdown of the Ranney Collector necessitating a re-evaluation of the remedial strategy at the Site. Additionally, the currently approved remedy does not include a time frame or strategy for shut down of the GWETS.

Under this alternative, the GWETS will continue to operate until dissolved contaminant mass removal is no longer effective. Mass removal rates are currently limited by the continued leaching of COCs from the residual mass. This is likely to continue for many years.

3.2 Expanded Groundwater Extraction and Treatment

An expansion of the existing GWETS could reduce the time required to meet RAOs when compared with the current GWETS configuration. This alternative would target areas with the highest levels of dissolved phase impacts to increase mass removal rates. For the purposes of this RAP, it has been assumed that the expanded system would consist of 14 new extraction wells located on the PG&E property. If this alternative is selected for implementation, the number and location of the extraction wells would be determined through groundwater modeling at the detailed design stage of the project.

Based on extraction rates of the existing system, it is estimated that an extraction rate of 6 to 8 gpm per well could be achieved for a total system extraction rate of between 85 and 100 gpm. The mass of BTEX and naphthalene removed during the first year is estimated to be on the order of 1,000 pounds.

Mass removal rates are anticipated to decline with time and it is probable that the expanded GWETS would increase contaminant removal over current removal rates for between 5 and 10 years. Following shutdown of the expanded GWETS, MNA would be implemented to achieve RAOs as in the currently approved alternative. The GCL cap would be maintained as part of this remedial solution.

Under this alternative, COC concentrations in groundwater would be reduced by physical removal via the GWETS and by destruction through intrinsic biodegradation under the MNA scenario. The time to reach RAOs with the expanded GWETS and MNA alternative is uncertain, but anticipated to be greater than 30 years. Implementation of a groundwater monitoring program and maintenance of an LUC would be included as part of this remedial alternative.

3.3 Physical Barrier

A physical subsurface barrier would control the leaching of contaminants from soil to groundwater by isolating COCs from groundwater. The subsurface barrier would be installed completely around the residual mass within the PG&E property to a depth of 45 feet bgs. The barrier would encompass the area of COC impacted soil and groundwater as presented on Figure 16. For the purposes of this RAP, it has been assumed that a subsurface barrier would be approximately 1,400 feet long.

In the north-east corner, the barrier would be installed at the property boundary, but contract towards the interior of the property elsewhere where feasible. However, as there is no low-permeable layer in which to key in a physical barrier, the barrier would remain open to groundwater at the base. The GCL cap would be included as part of this alternative which would reduce rain water infiltration into the subsurface helping to control the leaching of COCs to groundwater. However, fluctuations in groundwater levels resulting from changes in river levels would cause some transient leaching of dissolved phase COCs through the base of the barrier. The distance that these dissolved phase COCs could migrate down gradient would be limited by intrinsic biodegradation.

It is likely that a combination of different construction techniques would be used to construct the subsurface barrier. Along the eastern property boundary where Front Street would have to be supported, steel sheet-piles would likely be used. The rest of the barrier would be constructed using the cheaper slurry-wall construction technique whereby a 2 to 3 feet wide trench is excavated using a bentonite slurry to support the sides of the excavation then backfilled with a soil-bentonite mix to create a low-permeable subsurface barrier.

The performance of the subsurface barrier would be monitored using downgradient groundwater monitoring wells. These would be monitored for as long as the barrier remained in place. An LUC would be required as part of this remedial alternative.

3.4 In-Situ Soil Stabilization/Solidification

ISSS is a soil improvement technology developed for the construction of retaining or cut-off walls that is now commonly used to treat contaminated soils in-situ. As defined by the United States Environmental Protection Agency (USEPA) and the Portland Cement Association (USEPA 2000), ISSS encapsulates COCs to form a solid material with permeability much lower than the surrounding soil and restricts contaminant migration by decreasing the surface area exposed to groundwater and thus leaching. It would also reduce the leachability of the COCs by chemically immobilizing them or reducing their aqueous solubility.

Three types of ISSS mixing are available: Deep Soil Mixing (DSM), Shallow Soil Mixing (SSM), and Backhoe Stabilization (BOSS). At this Site, where soil will be stabilized to depths of between 25 and 45 feet bgs, DSM techniques will be used. With DSM, a series of overlapping stabilized soil columns (typically 24 to 56 inches in diameter) are created using mixing shafts or augers suspended from a crane. Usually, single or triple auger systems are used. A slurry grout is mixed above-ground, and, as the augers are advanced into the soil, the slurry is pumped through the hollow stem of the shaft and injected into the soil at the tip. The auger flights and mixing blades on the augers blend the soil with the slurry in pugmill fashion creating a soil-cement mass. To mitigate volatilization of COCs during implementation, a DSM rig with cover or shroud would be used that captures vapors for treatment (likely through a carbon system) before being released to the atmosphere.

For the purposes of this RAP, it has been assumed that clean soil placed after the 1991 excavation within the treatment area will be removed to approximately 12 feet bgs prior to implementing the ISSS as there is no reason to treat this clean soil. It has been assumed that approximately 30,000 cubic yards of soil would be removed. It has been assumed that a working platform would be created at the base of the excavation and the ISSS operation completed from within the excavation. The footprint of the excavation is shown on Figure 16. An estimated 47,000 cubic yards of soil would be stabilized.

A bench-scale treatability study was completed to develop an effective mix design to meet the treatability goals specified in the *Treatability Study – Revision 2 In Situ Soil Stabilization/Solidification* technical memorandum (ARCADIS 2009a). A 10 percent Portland cement and four percent granular activated carbon design met the treatability goals (ARCADIS 2010c); however additional laboratory testing will be completed to optimize the final design mix using the same procedures established in the treatability study work plan.

Once the soil COC residual mass is treated, dissolved-phase COCs remaining in the groundwater would be captured by the GWETS until concentrations of COCs in monitoring wells are reduced to below the cleanup levels. Groundwater monitoring would continue until cleanup levels are reached and for some period thereafter. A LUC would be required as part of this solution.

It would not be necessary to maintain the GCL cap using this alternative. Once the COCs are stabilized, there is no longer any reason to control rain water infiltration into the subsurface. However, when the Site is re-graded following ISSS implementation, a vegetated soil cap consisting of 3 feet of clean soil would be placed to minimize the possibility of direct human contact with the underlying soils.

4. Evaluation Criteria

The remedial alternatives were evaluated using guidance from CERCLA Section 121, in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA 1990), and USEPA Remedial Investigation/Feasibility Study guidance (USEPA 2010). In accordance with DTSC guidance (DTSC 1995), the NCP criteria considered and their application in this RAP are as follows:

- Overall Protection of Human Health and the Environment – Addresses how the alternative protects human health and the environment
- Compliance with ARARs – Addresses whether the alternative complies with regulatory cleanup standards
- Long-Term Effectiveness – Addresses the results of an alternative in terms of the residual risk remaining at the Site after the RAOs have been met
- Reduction of Mobility, Toxicity, and Volume Through Treatment – Addresses the statutory preference for selecting remedial actions that include treatment technologies that permanently and significantly reduce the mobility, toxicity, or volume of hazardous substances present at the Site
- Short-term Effectiveness – Addresses potential human health and environmental impacts of the alternative during the construction and implementation phase until remedial response objectives are met
- Implementability – Addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation
- Cost – Addresses both capital and O&M costs, and includes a net present value (NPV) analysis of all costs
- State Acceptance – Addresses the state's position and key concerns with the alternative
- Community Acceptance – Addresses components of the alternative that interested parties in the community support, have reservations about, or oppose

5. Comparative Analysis of Remedial Alternatives

This section presents a comparative analysis of the remedial alternatives being considered for this Site. A summary of the results of the analysis is presented in Table E-2; additional details are presented below.

5.1 Overall Protection of Human Health and the Environment

Each of the alternatives under consideration would be protective of human health and the environment. The existing GWETS, expanded GWETS, and physical barrier solutions would require maintenance of the GCL cap to be protective; the ISSS alternative would not, although a clean soil cover or asphalt cap would be required to minimize human contact with the subsurface. The deed restriction currently in place for the

PG&E parcel that prevents it from being used for residential purposes would either have to be maintained or modified to specify that any new construction would require engineering controls to control the exposure of users of the buildings to vapors. It is possible that vapor controls would not be required with the ISSS alternative; however, post implementation soil vapor monitoring would be required to confirm this.

5.2 Compliance with Applicable or Relevant and Appropriate Requirements and To Be Considered Materials

Each of the remedial alternatives under consideration would comply with location, action and, over time, with chemical-specific ARARs and TBCs. It is likely that the ISSS and barrier alternatives would meet the chemical-specific ARARs and TBCs much faster than either the existing or expanded GWETS alternatives.

5.3 Long-Term Effectiveness

Each of the alternatives under consideration would be effective in the long-term although it would take much longer to meet the cleanup levels with either the existing or enhanced GWETS solutions. The long-term effectiveness of the physical barrier would depend on the effectiveness of bio-attenuation processes to address low concentration COCs leaching into the groundwater through the open base of the barrier. The ISSS solution would be the most effective of the solutions under consideration in the long term. ISSS presents a permanent solution that does not rely on the maintenance of the GCL cap to be effective and is likely to address soil vapor concerns without the need for engineering controls should the Site ever be redeveloped.

5.4 Reduction of Toxicity, Mobility, and Volume through Treatment

The barrier solution does not reduce the toxicity, mobility, or volume of COCs through treatment; no treatment processes are included in the barrier alternative. The existing or enhanced GWETS solutions would treat limited amounts of COCs and would therefore be ranked higher than the barrier alternative under this criterion. ISSS reduces the mobility of COCs by treatment and, to some limited extent, reduces the toxicity by dilution with the grout additives. ISSS actually causes an expansion of the volume of COC-affected materials. Bench-scale data indicate an expansion of approximately 15 percent should be expected at this Site using the selected design mix.

5.5 Short-Term Effectiveness

ISSS and the barrier alternatives are likely to be more effective in the short-term than either the existing or expanded GWETS alternatives. Both GWETS alternatives would be unlikely to meet cleanup levels within the next 30 years while both the ISSS and barrier alternatives would likely attain the cleanup levels within approximately 5 years although the barrier alternative would require the ongoing maintenance of the GCL cap to continue to be protective.

5.6 Implementability

Maintenance, or expansion, of the existing GWETS would be quick and easy to design, permit and install. Both of the other alternatives would also be relatively easy to implement using standard construction techniques although either would be significantly more complicated than either of the GWETS solutions.

5.7 Cost

The cost estimates presented in this RAP were developed using USEPA guidance, professional engineering judgment, and quotations from appropriate vendors. In accordance with USEPA guidance, the cost estimates in this RAP have been prepared to an accuracy of -30 to +50 percent. All capital, O&M and long-term monitoring cost estimates are expressed in NPV (2010) dollars. Estimated costs are as follows:

- Continued GWETS operation $3,200,000
- Expanded GWETS $4,400,000
- Physical barrier $4,100,000
- ISSS $8,600,000

Cost estimates are presented in Table E-3.

5.8 State Acceptance

The State has already accepted the current GWETS system as a component of the current approved remedy for the Site. It is unlikely, therefore, that the State would have any issues with the expanded GWETS alternative. The State's position on the other alternatives is not known at this time.

5.9 Community Acceptance

Continued operation of the current GWETS is unlikely to generate any additional comment from the community. The community will be given an opportunity to comment on the other alternatives presented in this RAP during the 30-day public comment period.

6. Recommended Alternative

Despite being the most expensive alternative, ISSS is the recommended remedial alternative for this Site. Of the solutions considered, ISSS would require the least amount of monitoring and maintenance to remain protective of human health and the environment and would be the most effective of the solutions considered in the long-term. Additionally, ISSS best meets EPA's preference for reduction of toxicity, mobility and volume through treatment although some increase in volume will occur as a result of ISSS treatment. ISSS will likely attain the cleanup levels within approximately 5 years and will therefore be effective in the short-term. For these reasons, ISSS is the recommended remedial alternative for this Site.

7. References

ARCADIS. 2007a. Focused Feasibility Study, Front and T Streets Site, Sacramento, California. May 17.

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Geomatrix. 2001. Final Groundwater Engineering Evaluation/Cost Analysis (EE/CA) and Remedial Action Work Plan (RAW). Front and T Streets Site, Sacramento, California. April.

United States Environmental Protection Agency (USEPA). 1990. Code of Federal Regulations, Title 40, Part 300, National Oil and Hazardous Substances Pollution Contingency Plan. Federal Register. March.

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Table E-1
Technology Screening
PG&E Sacramento, Front and T Streets Site
Sacramento, California

Remedial Technology	Remedial Technology Process Option	Effectiveness	Implementability	Relative Cost Evaluation	Retained For Further Consideration?
Source Removal	Excavation	High: Permanently removes source mass and contaminated soil.	Moderate to Difficult: Ensuring complete removal of source mass is a concern. Excavation and off-site disposal of soils will present health and safety concerns. Excavation below the water table is implementable using standard construction techniques.	Very High	No. There are options that are similarly effective, more easily implementable, and less costly. Additionally, would anticipate significant community resistance to implementing this approach based on experience at this site.
Groundwater Extraction and Treatment (GWET)	Current GWETS	Low : Limited due to reliance on diffusion-driven mass transfer and small number of extraction wells. System would operate in perpetuity.	Easy: System is already in place at the site.	Moderate to High: Initial capital costs would be low but long term O&M costs would be significant.	Yes. Current remedy retained as a "no action" option.
	Expanded GWETS	Moderate: Limited due to reliance on diffusion-driven mass transfer.	Easy: Upgrade to current remedy. Would require operation in perpetuity.	Moderate to High: Initial capital costs would be low but long term O&M costs would be significant.	Yes. Upgrade of current remedy retained as an option.
	Surfactant/Co-solvent Enhanced Recovery	Low: Limited by the ability to affect lower permeability soils where most of the residual mass resides. Innovative technology not proven highly effective; prone to rebound. Risk of downward NAPL mobilization.	Easy to Moderate: Minor limitations due to site constraints/proximity of utilities to treatment area. High density of injection wells required to get adequate co-solvent distribution in the low permeability soil.	High: Increased capital and O&M costs when compared to existing GWETS. Demonstration and/or lab work likely to be required.	No. There are more effective and less costly options available.
In-Situ Thermal Treatment	Conductive or Electrical Resistivity Heating with Soil Vapor Extraction (low permeable soils), Steam Enhanced Extraction (high permeable soils)	High: Effective source mass removal and destruction. Any residual mass would be highly immobile.	Difficult: Controlling water influx (required for technology to be successful) at this site will be difficult. A subsurface barrier around the treatment area would likely be required. Additionally, a combination of technologies would be required to address the high and low permeable soils.	Very High: High capital costs and moderate O&M costs during implementation. Low O&M costs following implementation.	No. Although highly effective this option was eliminated because of implementability issues and high costs. .
In-Situ Chemical Treatment	Surfactant/Co-solvent Enhanced Chemical Oxidation	Low: Limited by the ability to affect lower permeability soil where most of the residual mass resides. Innovative technology not proven highly effective; prone to rebound. Risk of downward NAPL mobilization. Likely require long treatment time.	Easy to Moderate: Minor limitations due to site constraints/proximity of utilities to treatment area. High density of injection wells required to get adequate co-solvent distribution in the low permeability soil.	High: High capital costs. Demonstration and/or lab work likely to be required.	No. There are more effective, more easily implementable, and less costly options available.
In-Situ Biological Treatment	Aerobic Bioremediation	Low to Moderate: Limited by the ability to affect the lower permeability soil where most of the residual mass resides, adequate interaction between mobile and immobile pore space, and NAPL-wetted pore spaces. Prone to rebound in presence of residual NAPL.	Moderate: Controlled by site access constraints/proximity of utilities to treatment area. May require long treatment timeframe. Pilot testing will be required to verify design details.	Low: Low capital costs and moderate O&M costs.	No. Eliminated based on low to moderate effectiveness.
Containment	Physical Barrier	Moderate to High: Dependent on ability to control groundwater flow through the barrier and leakage under the base of the wall.	Relatively Easy: Implementable using standard construction techniques.	Moderate: Moderate capital costs. Long-term O&M limited to groundwater monitoring at moderate cost.	Yes. Retained as a technology for containment.
	In-Situ Soil Stabilization	High: Effective in binding residual mass in a solid matrix that reduces contact with groundwater and reduces mass transfer of COCs from soil matrix to the groundwater. Site-specific mix design required	Relatively Easy to Moderate: Implementable using standard construction techniques.	High: High capital costs. Long-term O&M limited to groundwater monitoring at moderate cost.	Yes. Retained as a technology for containment.

Note: Orange shading indicates alternative which was carried forward for further consideration.

Table E-2

Evaluation of Groundwater Remedial Alternatives for Addressing Source Mass

PG&E Sacramento, Front and T Streets Site

Sacramento, California

Items	1. No Action	2. Expanded GWETS	3. Physical Barrier	4. In Situ Stabilization
Description	•Continued operation of existing GWETS system and GW monitoring program	•Upgrade and expand the current GWETS for long-term operation. • 14 new extraction wells would be installed on PG&E property.	• Install low-permeability, subsurface barrier to contain the source mass • "Hanging wall" approach would be taken in absence of competent low-permeable lithologic stratum at the Site • Long-term O&M limited to groundwater monitoring at moderate cost • COC mass persists and is not removed; rise and fall of groundwater may leach COCs beneath barrier perimeter	• In situ mixing of stabilizing agents to bind source mass and prevent dissolution into groundwater. • No removal or destruction of source mass. • Long-term O&M limited to groundwater monitoring at moderate cost
Threshold Criteria				
1) Protection of Human Health and the Environment	•Protection through removal of dissolved COCs •Existing asphalt/GCL cap will require maintenance to prevent direct contact with source material at the surface	•Protection through removal of dissolved COCs •Existing asphalt/GCL cap will require maintenance to prevent direct contact with source material at the surface	•Protection through containment of COCs •Existing asphalt/GCL cap will require maintenance to prevent direct contact with source material at the surface	• Protection through containment of COCs • Either an asphalt or clean soil cover would be required to prevent direct contact with source material at the surface
2) Compliance with ARARs	• Complies with chemical-specific ARARs for off-site groundwater and treated groundwater discharge • Complies with location- and action-specific ARARs.	• Complies with chemical-specific ARARs for off-site groundwater and treated groundwater discharge • Complies with location- and action-specific ARARs	• Complies with chemical-specific ARARs for groundwater outside barrier • No chemical-specific ARARs for soil and air. • Complies with location- and action-specific ARARs.	• Complies with chemical-specific ARARs for groundwater at compliance points • No chemical-specific ARARs for soil and air • Complies with location- and action-specific ARARs
Balancing Criteria				
3) Long-Term Effectiveness and Permanence	• Effectiveness is limited due to reliance on diffusion-driven mass transfer, resulting in ineffective reduction of residual source mass. This is exacerbated by the presence of NAPL and residence of source mass in lower permeability lithologic zone.	• Effectiveness is limited due to reliance on diffusion-driven mass transfer, resulting in ineffective reduction of residual source mass. This is exacerbated by the presence of NAPL and residence of source mass in lower permeability lithologic zone. • This alternative would be more effective than the No Action alternative but would still require long term O&M.	• Dependent on ability to control groundwater flow through the barrier and leakage under the base of the wall. Preliminary analysis indicates that control of groundwater flow can be achieved and that the migration of low concentrations leaking out of the barrier will be limited by bio-attenuation. • Barrier would be installed within property boundaries and would not be effective on residual contaminant mass located outside property boundaries. • Engineering controls for vapor intrusion would likely be required for future site development to be protective of human health.	• Effective in binding residual mass in a solid matrix that reduces contact with groundwater and reduces mass transfer of COCs from soil matrix to the groundwater. Effectiveness controlled by adequate mixing in the field. • Reduction of soil vapors is expected due to encapsulation of source material.
4) Reduction in Toxicity, Mobility, Volume Through Treatment	• No effective reduction in toxicity or mass through treatment. Reduction in mobility through containment.	• No effective reduction in toxicity or mass through treatment. Reduction in mobility through containment.	• No reduction in toxicity or mass through treatment. Reduction in mobility through containment.	• Reduction in mobility through treatment. No reduction in toxicity and increase in volume through treatment.
5) Short-Term Effectiveness	• Short-term potential exposure risks would be minimal and limited to site workers.	• Short-term potential exposure risks would be minimal and limited to site workers.	• Short-term potential exposure risks would be moderate and limited to site workers.	• Short-term potential exposure risks would be moderate and limited to site workers.

Table E-2

Evaluation of Groundwater Remedial Alternatives for Addressing Source Mass

PG&E Sacramento, Front and T Streets Site

Sacramento, California

Items	1. No Action	2. Expanded GWETS	3. Physical Barrier	4. In Situ Stabilization
6) Implementability	• Pump and treat is currently being implemented. Will require perpetual O&M.	• Pump and treat is currently being implemented. Will require perpetual O&M.	• Barrier will be constructed using standard construction techniques.	• Implementable likely using large-diameter auger mixing. • Bench scale study completed which developed mix that will stabilize site-specific COCs.
7) NPV Cost	**Total Inflation Adjusted Cost: $9,500 000 Total Discounted Cost: $3,300,000 (4% inflation, 7% discount assumed)**	**Total Inflation Adjusted Cost: $12,100 000 Total Discounted Cost: $4,100,000 (4% inflation, 7% discount assumed)**	**Total Inflation Adjusted Cost: $4,100 000 Total Discounted Cost: $4,000,000 (4% inflation, 7% discount assumed)**	**Total Inflation Adjusted Cost: $8,700 000 Total Discounted Cost: $8,600,000 (4% inflation, 7% discount assumed)**
Modifying Criteria				
8) State Acceptance	• Current remedy previously approved by regulatory agencies.	• Current remedy previously approved by regulatory agencies.	• Not evaluated to date, but technology has been approved on similar projects in the past.	• Not evaluated to date, but technology has been approved on similar projects in the past.
9) Community Acceptance	• Current remedy previously approved by community.	• Current remedy previously approved by community.	• Not evaluated to date.	• Not evaluated to date.

Table E-3a
Cost Estimates for Remedial Alternatives
PG&E Sacramento, Front and T Streets Site
Sacramento, California

	Current GWETS	Expanded GWETS	Physical Barrier	In Situ Stabilization
	Alternative #1	**Alternative #2**	**Alternative #3**	**Alternative #4**
Capital Costs				
Total Capital Cost (2010 Dollars)	--	$344,200	$3,334,300	$8,024,500
Remediation Costs				
Annual GWETS O&M Cost (2010 Dollars)	$89,300	$129,400	$80,400	$80,400
Years of Active Remediation	30	30	1.5	1.5
Total Active Remediation NPV Cost	$1,708,400	$2,475,600	$111,700	$111,700
Project Management and Cap Maintenance Costs				
Annual Project Management and Cap Maintenance (2010 Dollars) - Years 1 to 5	$40,800	$40,800	$33,200	$28,800
Annual Project Management and Cap Maintenance (2010 Dollars) - Years 6 to 30	$40,800	$40,800	$7,700	$700
Years of Project Management and Cap Maintenance	30	30	30 (including construction)	30 (including construction)
Total PM & Cap Maintenance NPV Cost	$780,500	$780,500	$327,600	$137,600
Groundwater Monitoring Costs				
Annual GW Monitoring Reporting (2010 Dollars) - During years when monitoring occurs	$14,200	$14,200	$14,200	$14,200
Groundwater Monitoring (2010 Dollars) - Years 1 to 2	$25,400	$25,400	$78,100	$78,100
Groundwater Monitoring (2010 Dollars) - Years 3 to 4	$25,400	$25,400	$30,100	$30,100
Groundwater Monitoring (2010 Dollars) - Year 5	$25,400	$25,400	$20,000	$20,000
Groundwater Monitoring (2010 Dollars) - Years 6 to 30	$25,400	$25,400	--	--
Years of GW Monitoring	30	30	5	5
Total GW Monitoring NPV Cost	$757,600	$757,600	$275,800	$275,800
Site Closure Costs				
Site Closure Activities (2010 Dollars)	--	--	$74,400	$74,400
Total Inflation Adjusted Cost:	$9,500,000	$12,100,000	$4,500,000	$8,700,000
Total NPV:	**$3,200,000**	**$4,400,000**	**$4,100,000**	**$8,600,000**

Inflation Rate: **4%**
Discount Rate: **7%**

Table E-3b
Estimated Cost to Complete: Current GWETS

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
GWETS YEARLY OPERATIONS AND MAINTENANCE					
GWETS System O&M					$75,041
Project Sci/Eng/Arch/Designer	hour	96	$100	$9,600	
Technician III	hour	240	$76	$18,240	
Project Assistant	hour	12	$63	$756	
Electricity	month	12	$1,000	$12,000	
Carbon change out	event	0.2	$32,800	$6,560	
Yearly extraction well rehabilitation and system repair	event	2	$5,000	$10,000	
Quarterly sampling	event	4	$4,000	$16,000	
Expenses	lump sum	1	$1,885	$1,885	
Discharge Monthly Report					$9,912
Senior Sci/Eng/Arch/Designer	hour	12	$135	$1,620	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Staff Sci/Eng/Arch/Designer	hour	48	$85	$4,080	
CADD/Drafter II	hour	0	$80	$0	
Project Assistant	hour	12	$63	$756	
Clerical / Secretarial	hour	12	$63	$756	
Expenses	lump sum	1	$1,500	$1,500	
Subtotal					**$84,953**
Contingency (5% scope)					**$4,248**
				GWETS TOTAL YEARLY COST:	**$89,300**
ANNUAL CAP MAINTENANCE & PROJECT MANAGEMENT (Years 1-30)					
Annual Asphalt & GCL Cover O&M					$14,520
Task Manager	hour	12	$100	$1,200	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Technician III	hour	120	$76	$9,120	
Expenses	lump sum	1	$3,000	$3,000	
Annual Program and Project Management					
Monthly Accounting Reconciliation/General PM					$12,472
Program Manager	hour	12	$179	$2,148	
Project Manager	hour	24	$163	$3,912	
Task Manager	hour	48	$100	$4,800	
Project Advisor	hour	12	$63	$756	
Project Assistant	hour	12	$63	$756	
Expenses	lump sum	1	$100	$100	
Project Review and Replanning					$3,619
Program Manager	hour	4	$179	$716	
Project Manager	hour	6	$163	$978	
Task Manager	hour	4	$100	$400	
Project Assistant	hour	1	$63	$63	
Principal Sci/Eng/Arch/Designer	hour	8	$179	$1,432	
Expenses	lump sum	1	$30	$30	
Health and Safety Audits					$3,908
Project Manager	hour	4	$163	$652	
Senior Sci/Eng/Arch/Designer	hour	16	$135	$2,160	
Project Sci/Eng/Arch/Designer	hour	8	$100	$800	
Clerical / Secretarial	hour	4	$63	$252	
Expenses	lump sum	1	$44	$44	

Table E-3b
Estimated Cost to Complete: Current GWETS

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
Regulatory Meeting					$4,259
Program Manager	hour	4	$179	$716	
Project Manager	hour	7	$163	$1,060	
Project Advisor	hour	4	$63	$252	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Task Manager	hour	9	$100	$850	
Expenses	lump sum	1	$881	$881	
Subtotal					**$38,778**
Contingency (5% scope)					**$1,939**
				YEARLY PM & REPORTING:	**$40,800**
ANNUAL GROUNDWATER MONITORING					
Groundwater Monitoring Annual Report					$13,451
Senior Sci/Eng/Arch/Designer	hour	8	$135	$1,080	
Project Sci/Eng/Arch/Designer	hour	80	$100	$8,000	
Staff Sci/Eng/Arch/Designer	hour	24	$85	$2,040	
CADD/Drafter II	hour	20	$80	$1,600	
Project Assistant	hour	3	$63	$189	
Clerical / Secretarial	hour	3	$63	$189	
Expenses	lump sum	1	$353	$353	
Subtotal					**$13,451**
Contingency (5% scope)					**$673**
				CURRENT GW MONITORING YEARLY COST:	**$14,200**
Current Groundwater Monitoring (Semi-annual)					$24,116
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Technician III	hour	80	$76	$6,080	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$11,800	$11,800	
Expenses	lump sum	1	$5,510	$5,510	
Subtotal					**$24,116**
Contingency (5% scope)					**$1,206**
				CURRENT GW MONITORING YEARLY COST:	**$25,400**

Notes:
Subtotals are rounded to the nearest hundred dollars

Table E-3c
Estimated Cost to Complete: Expanded GWETS

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
GWETS YEARLY OPERATIONS AND MAINTENANCE					
GWETS System O&M					$113,281
Project Sci/Eng/Arch/Designer	hour	96	$100	$9,600	
Technician III	hour	240	$76	$18,240	
Project Assistant	hour	12	$63	$756	
Electricity	month	12	$2,000	$24,000	
Carbon change out	event	1	$32,800	$32,800	
Yearly extraction well rehabilitation and system repair	event	2	$5,000	$10,000	
Quarterly sampling	event	4	$4,000	$16,000	
Expenses	lump sum	1	$1,885	$1,885	
Discharge Monthly Report					$9,912
Senior Sci/Eng/Arch/Designer	hour	12	$135	$1,620	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Staff Sci/Eng/Arch/Designer	hour	48	$85	$4,080	
CADD/Drafter II	hour	0	$80	$0	
Project Assistant	hour	12	$63	$756	
Clerical / Secretarial	hour	12	$63	$756	
Expenses	lump sum	1	$1,500	$1,500	
Subtotal					**$123,193**
Contingency (5% scope)					**$6,160**
				GWETS TOTAL YEARLY COST:	**$129,400**
ANNUAL CAP MAINTENANCE AND PROJECT MANAGEMENT (Years 1 - 30)					
Annual Asphalt & GCL Cover O&M					$14,520
Task Manager	hour	12	$100	$1,200	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Technician III	hour	120	$76	$9,120	
Expenses	lump sum	1	$3,000	$3,000	
Program and Project Management					
Monthly Accounting Reconciliation/General PM					$12,472
Program Manager	hour	12	$179	$2,148	
Project Manager	hour	24	$163	$3,912	
Task Manager	hour	48	$100	$4,800	
Project Advisor	hour	12	$63	$756	
Project Assistant	hour	12	$63	$756	
Expenses	lump sum	1	$100	$100	
Project Review and Replanning					$3,619
Program Manager	hour	4	$179	$716	
Project Manager	hour	6	$163	$978	
Task Manager	hour	4	$100	$400	
Project Assistant	hour	1	$63	$63	
Principal Sci/Eng/Arch/Designer	hour	8	$179	$1,432	
Expenses	lump sum	1	$30	$30	
Health and Safety Audits					$3,908
Project Manager	hour	4	$163	$652	
Senior Sci/Eng/Arch/Designer	hour	16	$135	$2,160	
Project Sci/Eng/Arch/Designer	hour	8	$100	$800	
Clerical / Secretarial	hour	4	$63	$252	
Expenses	lump sum	1	$44	$44	
Regulartory Meeting					$4,259
Program Manager	hour	4	$179	$716	
Project Manager	hour	7	$163	$1,060	
Project Advisor	hour	4	$63	$252	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Task Manager	hour	9	$100	$850	
Expenses	lump sum	1	$881	$881	
Subtotal					**$38,778**
Contingency (5% scope)					**$1,939**
				MONITORING, MANAGEMENT, AND REPORTING TOTAL YEARLY COST:	**$40,800**

Table E-3c
Estimated Cost to Complete: Expanded GWETS

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
CONSTRUCTION COSTS					
Designs and Plans					$20,000
Design and contracting	lump sum	1	$20,000	$20,000	
GWETS System Upgrade and Repairs					
Installation of additional extraction and monitoring wells					$91,467
Drilling subcontractor (extraction well)	well	8	$9,764	$78,112	
Permitting/Surveying/Utility Clearance	lump sum	1	$4,000	$4,000	
Waste characterization	each	1	$300	$300	
Waste disposal	lump sum	1	$7,875	$7,875	
Field Expenses	day	4	$295	$1,180	
System Capital					$26,600
Extraction Pumps	each	8	$1,100	$8,800	
Piping/Manifold	each	1	$5,000	$5,000	
Installation labor	day	3	$3,200	$9,600	
System start up	day	1	$3,200	$3,200	
Trenching and Piping					$139,580
Trenching/Backfill/Resurfacing	lf	1200	$100	$120,000	
Piping (3" PVC80)	lf	1200	$10	$12,000	
Trenching oversight	day	4	$1,600	$6,400	
Field Expenses	day	4	$295	$1,180	
Well and System Installation Oversight and Coordination					$11,628
Task Manager	hour	10	$100	$1,000	
Project Sci/Eng/Arch/Designer	hour	8	$100	$800	
Technician III	hour	126	$76	$9,576	
Project Assistant	hour	4	$63	$252	
Subtotal					**$289,275**
Contingency (20% construction scope, 5% scope for other tasks)					**$54,855**
				CONSTRUCTION COST:	**$344,200**
ANNUAL GROUNDWATER MONITORING					
Groundwater Monitoring Annual Report					$13,451
Senior Sci/Eng/Arch/Designer	hour	8	$135	$1,080	
Project Sci/Eng/Arch/Designer	hour	80	$100	$8,000	
Staff Sci/Eng/Arch/Designer	hour	24	$85	$2,040	
CADD/Drafter II	hour	20	$80	$1,600	
Project Assistant	hour	3	$63	$189	
Clerical / Secretarial	hour	3	$63	$189	
Expenses	lump sum	1	$353	$353	
Subtotal					**$13,451**
Contingency (5% scope)					**$673**
				CURRENT GW REPORTING YEARLY COST:	**$14,200**
Current Groundwater Monitoring (Semi-annual)					$24,116
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Technician III	hour	80	$76	$6,080	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$11,800	$11,800	
Expenses	lump sum	1	$5,510	$5,510	
Subtotal					**$24,116**
Contingency (5% scope)					**$1,206**
				CURRENT GW MONITORING YEARLY COST:	**$25,400**

Notes:

Subtotals are rounded to the nearest hundred dollars

Table E-3d
Estimated Cost to Complete : Physical Barrier

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
GWETS YEARLY OPERATIONS AND MAINTENANCE					
GWETS System O&M					$66,596
Project Sci/Eng/Arch/Designer	hour	96	$100	$9,600	
Technician III	hour	240	$76	$18,240	
Project Assistant	hour	12	$63	$756	
Electricity	month	12	$1,000	$12,000	
Carbon change out	event	0	$32,800	$0	
Yearly extraction well rehabilitation and system repair	event	2	$5,000	$10,000	
Quarterly sampling	event	4	$4,000	$16,000	
Expenses	lump sum	1	$1,885	$1,885	
Discharge Monthly Report					$9,912
Senior Sci/Eng/Arch/Designer	hour	12	$135	$1,620	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Staff Sci/Eng/Arch/Designer	hour	48	$85	$4,080	
CADD/Drafter II	hour	0	$80	$0	
Project Assistant	hour	12	$63	$756	
Clerical / Secretarial	hour	12	$63	$756	
Expenses	lump sum	1	$1,500	$1,500	
Subtotal					**$76,508**
Contingency (5% scope)					**$3,825**
				GWETS TOTAL YEARLY COST:	**$80,400**
ANNUAL CAP MAINTENANCE (Years 1-30)					
Annual Asphalt & GCL Cover O&M					$7,240
Task Manager	hour	12	$100	$1,200	
Project Sci/Eng/Arch/Designer	hour	0	$100	$0	
Technician III	hour	40	$76	$3,040	
Expenses	lump sum	1	$3,000	$3,000	
Subtotal					**$7,240**
Contingency (5% scope)					**$362**
				ANNUAL CAP MAINTENANCE TOTAL YEARLY COST:	**$7,700**
PROJECT MANAGEMENT (Years 1 to 5)					
Program and Project Management					
Monthly Accounting Reconciliation/General PM					$12,472
Program Manager	hour	12	$179	$2,148	
Project Manager	hour	24	$163	$3,912	
Task Manager	hour	48	$100	$4,800	
Project Advisor	hour	12	$63	$756	
Project Assistant	hour	12	$63	$756	
Expenses	lump sum	1	$100	$100	
Project Review and Replanning					$3,619
Program Manager	hour	4	$179	$716	
Project Manager	hour	6	$163	$978	
Task Manager	hour	4	$100	$400	
Project Assistant	hour	1	$63	$63	
Principal Sci/Eng/Arch/Designer	hour	8	$179	$1,432	
Expenses	lump sum	1	$30	$30	
Health and Safety Audits					$3,908
Project Manager	hour	4	$163	$652	
Senior Sci/Eng/Arch/Designer	hour	16	$135	$2,160	
Project Sci/Eng/Arch/Designer	hour	8	$100	$800	
Clerical / Secretarial	hour	4	$63	$252	
Expenses	lump sum	1	$44	$44	

Table E-3d
Estimated Cost to Complete : Physical Barrier

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
Regulatory Meeting					$4,259
Program Manager	hour	4	$179	$716	
Project Manager	hour	7	$163	$1,060	
Project Advisor	hour	4	$63	$252	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Task Manager	hour	9	$100	$850	
Expenses	lump sum	1	$881	$881	
Subtotal					**$24,258**
Contingency (5% scope)					**$1,213**
	MONITORING, MANAGEMENT, AND REPORTING TOTAL YEARLY COST:				**$25,500**
CONSTRUCTION COSTS					
Reports					$119,000
Pre-Design Supplemental Investigation Workplan	lump sum	1	$12,000	$12,000	
Remedial Design, Design Report and Contracting (Containment Walls)	lump sum	1	$82,000	$82,000	
Remedial Action Report (RAR)	lump sum	1	$25,000	$25,000	
Pre-design Investigation					
Supplemental Investigation					$87,600
Project Sci/Eng/Arch/Designer	hour	20	$145	$2,906	
Staff Sci/Eng/Arch/Designer	hour	113	$128	$14,514	
Utility Clearance	day	1	$1,450	$1,450	
Geoprobe Installation	lump sum	1	$52,284	$52,284	
Laboratory Analysis	each	63	$203	$12,758	
Expenses	lump sum	1	$3,591	$3,591	
Treatability Testings for Slurry Wall					$35,000
Contractor fee	lump sum	1	$35,000	$35,000	
Plans					$20,000
HASP Addendum	lump sum	1	$5,000	$5,000	
Construction Quality Control Plan	lump sum	1	$5,000	$5,000	
Waste Management Plan Preparation	lump sum	1	$5,000	$5,000	
Stormwater Management Plan	lump sum	1	$5,000	$5,000	
Physical Barrier Implementation					
Oversight and Coordination Labor					$63,928
Task Manager	hour	140	$100	$14,000	
Project Sci/Eng/Arch/Designer	hour	175	$100	$17,500	
Staff Sci/Eng/Arch/Designer	hour	340	$85	$28,900	
Project Assistant	hour	56	$63	$3,528	
Permitting/Surveying/Utility Clearance					$36,000
Construction Permits/E&S Plans	lump sum	1	$25,000	$25,000	
Utility Locating & Markout	lump sum	1	$1,000	$1,000	
Surveying - Establish Control Points, Base Mapping, As-builts, Etc	lump sum	1	$10,000	$10,000	
Site Preparation/Construction/Management					$196,448
Mobilization/Demobilization (Slurry wall)	lump sum	1	$70,000	$70,000	
Mobilization/Demobilization (Sheet-pile)	lump sum	1	$100,000	$100,000	
Site Preparation Activities	lump sum	1	$5,000	$5,000	
Construction Entrance	cubic yard	60	$60	$3,600	
E&S Controls - Miscellaneous Costs - Strawbales; Filter Bags; etc	lump sum	1	$5,000	$5,000	
Silt Fence	lf	1570	$5	$7,848	
Air Monitoring	month	1	$3,000	$3,000	
Dust Control	month	1	$2,000	$2,000	
Containment Wall					$1,733,000
Geotechnical Evaluation	Lump Sum	1	$20,000	$20,000	
Soil-Bentonite Slurry Wall	square foot	47200	$12	$566,400	
Sealed Sheet Pile	square foot	18200	$57	$1,037,400	
Sheet Pile Corrosion Protection	square foot	18200	$6	$109,200	
Material Handling					$106,900
Material Stockpile Area & Management	lump sum	1	$8,000	$8,000	
Material Load-out Activities	ton	2360	$5	$11,800	
Transportation & Disposal - Non-Hazardous	ton	2360	$35	$82,600	
Waste Characterization Sampling	ea	5	$900	$4,500	

Table E-3d
Estimated Cost to Complete : Physical Barrier

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
Site Restoration					$63,589
Backfill, Compaction, and Site Grading	cubic yard	1573	$8	$12,588	
Asphalt Restoration - Slurry Seal/Chip Seal	square yard	3000	$2	$6,600	
Geotextile	square foot	27000	$0.2	$5,400	
Trenching	linear foot	1300	$30	$39,000	
Expenses	lump sum	1	$8,330	$8,330	$8,330
Subtotal					**$2,469,795**
Contingency (20% scope, 15% bid)					**$864,428**
				CONSTRUCTION COST:	**$3,334,300**
YEARLY GROUNDWATER MONITORING					
Groundwater Monitoring Annual Report (Years 1-5)					$13,451
Senior Sci/Eng/Arch/Designer	hour	8	$135	$1,080	
Project Sci/Eng/Arch/Designer	hour	80	$100	$8,000	
Staff Sci/Eng/Arch/Designer	hour	24	$85	$2,040	
CADD/Drafter II	hour	20	$80	$1,600	
Project Assistant	hour	3	$63	$189	
Clerical / Secretarial	hour	3	$63	$189	
Expenses	lump sum	1	$353	$353	
Subtotal					**$13,451**
Contingency (5% scope)					**$673**
				GROUNDWATER MONITORING REPORT:	**$14,200**
Construction to 6 months Post-GWETS Groundwater Monitoring (Years 1-2)					$74,340
Task Manager	hour	3	$100	$300	
Project Sci/Eng/Arch/Designer	hour	15	$100	$1,500	
Technician III	hour	174	$76	$13,224	
Project Assistant	hour	12	$63	$756	
Laboratory Analysis	lump sum	1	$25,500	$25,500	
Expenses	lump sum	1	$33,060	$33,060	
Subtotal					**$74,340**
Contingency (5% scope)					**$3,717**
				CONSTRUCTION TO 6 MONTHS POST-GWETS GW MONITORING YEARLY COST:	**$78,100**
Phase I GWETS Shutdown Groundwater Monitoring (Years 3-4)					$28,642
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	6	$100	$600	
Technician III	hour	76	$76	$5,776	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$11,020	$11,020	
Expenses	lump sum	1	$11,020	$11,020	
Subtotal					**$28,642**
Contingency (5% scope)					**$1,432**
				PHASE I GWETS SHUTDOWN GW MONITORING YEARLY COST:	**$30,100**
Phase II GWETS Shutdown Groundwater Monitoring (Year 5)					$19,004
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Technician III	hour	58	$76	$4,408	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$8,360	$8,360	
Expenses	lump sum	1	$5,510	$5,510	
Subtotal					**$19,004**
Contingency (5% scope)					**$950**
				PHASE II GWETS SHUTDOWN GW MONITORING YEARLY COST:	**$20,000**
Site Closure Activities					$70,857
Well Abandonment and P&T System Decommission	lump sum	1	$42,857	$42,857	
Site Closure Report (SCR)	lump sum	1	$28,000	$28,000	
Subtotal					**$70,857**
Contingency (5% scope)					**$3,543**
				PHASE II GWETS SHUTDOWN GW MONITORING YEARLY COST:	**$74,400**

Notes:
Subtotals are rounded to the nearest hundred dollars

Table E-3e
Estimated Cost to Complete : In Situ Stabilzation & Solidification Remedial Alternative

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
GWETS YEARLY OPERATIONS AND MAINTENANCE					
GWETS System O&M					$66,596
Project Sci/Eng/Arch/Designer	hour	96	$100	$9,600	
Technician III	hour	240	$76	$18,240	
Project Assistant	hour	12	$63	$756	
Electricity	month	12	$1,000	$12,000	
Carbon change out	event	0	$32,800	$0	
Yearly extraction well rehabilitation and system repair	event	2	$5,000	$10,000	
Quarterly sampling	event	4	$4,000	$16,000	
Expenses	lump sum	1	$1,885	$1,885	
Discharge Monthly Report					$9,912
Senior Sci/Eng/Arch/Designer	hour	12	$135	$1,620	
Project Sci/Eng/Arch/Designer	hour	12	$100	$1,200	
Staff Sci/Eng/Arch/Designer	hour	48	$85	$4,080	
CADD/Drafter II	hour	0	$80	$0	
Project Assistant	hour	12	$63	$756	
Clerical / Secretarial	hour	12	$63	$756	
Expenses	lump sum	1	$1,500	$1,500	
Subtotal					**$76,508**
Contingency (5% scope)					**$3,825**
				GWETS TOTAL YEARLY COST:	**$80,400**
CLEAN FILL COVER MONITORING YEARS 1 TO 5					
Annual Clean Fill Cover O&M (No GCL)					$3,060
Task Manager	hour	8	$100	$800	
Technician III	hour	10	$76	$760	
Expenses	lump sum	1	$1,500	$1,500	
Subtotal					**$3,060**
Contingency (5% scope)					**$153**
				CLEAN FILL MONITORING YEARLY COST:	**$3,300**
CLEAN FILL COVER MONITORING YEARS 6 TO 30					
Annual Clean Fill Cover O&M (No GCL)					$604
Task Manager	hour	1	$100	$100	
Technician III	hour	4	$76	$304	
Expenses	lump sum	1	$200	$200	
Subtotal					**$604**
Contingency (5% scope)					**$30**
				CLEAN FILL MONITORING YEARLY COST:	**$700**
PROJECT MANAGEMENT (Years 1 to 5)					
Program and Project Management					
Monthly Accounting Reconciliation/General PM					$12,472
Program Manager	hour	12	$179	$2,148	
Project Manager	hour	24	$163	$3,912	
Task Manager	hour	48	$100	$4,800	
Project Advisor	hour	12	$63	$756	
Project Assistant	hour	12	$63	$756	
Expenses	lump sum	1	$100	$100	
Project Review and Replanning					$3,619
Program Manager	hour	4	$179	$716	
Project Manager	hour	6	$163	$978	
Task Manager	hour	4	$100	$400	
Project Assistant	hour	1	$63	$63	
Principal Sci/Eng/Arch/Designer	hour	8	$179	$1,432	
Expenses	lump sum	1	$30	$30	

Table E-3e
Estimated Cost to Complete : In Situ Stabilzation & Solidification Remedial Alternative

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
Health and Safety Audits					$3,908
Project Manager	hour	4	$163	$652	
Senior Sci/Eng/Arch/Designer	hour	16	$135	$2,160	
Project Sci/Eng/Arch/Designer	hour	8	$100	$800	
Clerical / Secretarial	hour	4	$63	$252	
Expenses	lump sum	1	$44	$44	
Regulatory Meeting					$4,259
Program Manager	hour	4	$179	$716	
Project Manager	hour	7	$163	$1,060	
Project Advisor	hour	4	$63	$252	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Task Manager	hour	9	$100	$850	
Expenses	lump sum	1	$881	$881	
Subtotal					**$24,258**
Contingency (5% scope)					**$1,213**
				MANAGEMENT TOTAL YEARLY COST:	**$25,500**
CONSTRUCTION COSTS					
Reports					$107,000
Remedial Design, Design Report and Contracting (ISSS)	lump sum	1	$82,000	$82,000	
Remedial Action Report (RAR)	lump sum	1	$25,000	$25,000	
Plans					$20,000
HASP Addendum	lump sum	1	$5,000	$5,000	
Construction Quality Control Plan	lump sum	1	$5,000	$5,000	
Waste Management Plan Preparation	lump sum	1	$5,000	$5,000	
Stormwater Management Plan	lump sum	1	$5,000	$5,000	
ISSS Implementation					
Oversight and Coordination Labor					$291,096
Project Manager	hour	144	$163	$23,472	
Task Manager	hour	432	$100	$43,200	
Project Sci/Eng/Arch/Designer	hour	820	$100	$82,000	
Staff Sci/Eng/Arch/Designer	hour	1640	$85	$139,400	
Project Assistant	hour	48	$63	$3,024	
Permitting/Surveying/Utility Clearance					$36,000
Construction Permits/E&S Plans	lump sum	1	$25,000	$25,000	
Utility Locating & Markout	lump sum	1	$1,000	$1,000	
Surveying - Establish Control Points, Base Mapping, As-builts, Etc	lump sum	1	$10,000	$10,000	
Site Preparation/Construction/Management					$281,587
Mobilization/Demobilization - Insitu Stabilization	lump sum	1	$150,000	$150,000	
Site Preparation Activities	lump sum	1	$5,000	$5,000	
Construction Entrance	cubic yard	60	$60	$3,600	
E&S Controls - Miscellaneous Costs - Strawbales; Filter Bags; etc	lump sum	1	$5,000	$5,000	
Silt Fence	lf	1490	$5	$7,452	
Excavation of Asphalt, Aggregate, GCL, and Fill Material	cubic yard	18107	$5	$90,535	
Air Monitoring	month	2	$3,000	$6,000	
Vapor/ Odor Control	month	2	$5,000	$10,000	
Dust Control	month	2	$2,000	$4,000	
In-Situ Auger Mixing	cubic yard	45764	$100	$4,576,400	$4,576,400
Material Handling					$457,000
Material Stockpile Area & Management	lump sum	1	$8,000	$8,000	
Material Load-out Activities	ton	10820	$5	$54,100	
Transportation & Disposal - Non-Hazardous	ton	10820	$35	$378,700	
Waste Characterization Sampling	ea	18	$900	$16,200	
Site Restoration					$156,967
Backfill, Compaction, and Site Grading	cubic yard	18107	$8	$144,874	
Asphalt Restoration - Slurry Seal/Chip Seal	square yard	5497	$2	$12,093	
Expenses	lump sum	1	$17,980	$17,980	$17,980
Subtotal					**$5,944,030**
Contingency (20% scope, 15% bid)					**$2,080,411**
				CONSTRUCTION COST:	**$8,024,500**

Table E-3e
Estimated Cost to Complete : In Situ Stabilzation & Solidification Remedial Alternative

Description	Units	Units Required	Unit Cost ($)	Total Cost ($)	Subtotals ($)
GW Monitoring					
Groundwater Monitoring Annual Report (Years 1-5)					$13,451
Senior Sci/Eng/Arch/Designer	hour	8	$135	$1,080	
Project Sci/Eng/Arch/Designer	hour	80	$100	$8,000	
Staff Sci/Eng/Arch/Designer	hour	24	$85	$2,040	
CADD/Drafter II	hour	20	$80	$1,600	
Project Assistant	hour	3	$63	$189	
Clerical / Secretarial	hour	3	$63	$189	
Expenses	lump sum	1	$353	$353	
Subtotal					**$13,451**
Contingency (5% scope)					**$673**
			GROUNDWATER MONITORING ANNUAL REPORT YEARLY COST:		**$14,200**
Construction to 6 months Post-GWETS Groundwater Monitoring (Years 1-2)					$74,340
Task Manager	hour	3	$100	$300	
Project Sci/Eng/Arch/Designer	hour	15	$100	$1,500	
Technician III	hour	174	$76	$13,224	
Project Assistant	hour	12	$63	$756	
Laboratory Analysis	lump sum	1	$25,500	$25,500	
Expenses	lump sum	1	$33,060	$33,060	
Subtotal					**$74,340**
Contingency (5% scope)					**$3,717**
			CONSTRUCTION TO 6 MONTHS POST-GWETS GW MONITORING YEARLY COST:		**$78,100**
Phase I GWETS Shutdown Groundwater Monitoring (Years 3-4)					$28,642
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	6	$100	$600	
Technician III	hour	76	$76	$5,776	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$11,020	$11,020	
Expenses	lump sum	1	$11,020	$11,020	
Subtotal					**$28,642**
Contingency (5% scope)					**$1,432**
			PHASE I GWETS SHUTDOWN GW MONITORING YEARLY COST:		**$30,100**
Phase II GWETS Shutdown Groundwater Monitoring (Year 5)					$19,004
Task Manager	hour	1	$100	$100	
Project Sci/Eng/Arch/Designer	hour	5	$100	$500	
Technician III	hour	58	$76	$4,408	
Project Assistant	hour	2	$63	$126	
Laboratory Analysis	lump sum	1	$8,360	$8,360	
Expenses	lump sum	1	$5,510	$5,510	
Subtotal					**$19,004**
Contingency (5% scope)					**$950**
			PHASE II GWETS SHUTDOWN GW MONITORING YEARLY COST:		**$20,000**
Site Closure Activities					$70,857
Well Abandonment and P&T System Decommission	lump sum	1	$42,857	$42,857	
Site Closure Report (SCR)	lump sum	1	$28,000	$28,000	
Subtotal					**$70,857**
Contingency (5% scope)					**$3,543**
				SITE CLOSURE ACTIVITIES COST:	**$74,400**

Notes:

Subtotals are rounded to the nearest thousand dollars, grand total to the nearest hundred thousand.

ARCADIS

Appendix F

Draft Land Use Covenant for PG&E Parcel

ARCADIS

Appendix F

Draft Land Use Covenant for PG&E Parcel

RECORDING REQUESTED BY:

PACIFIC GAS AND ELECTRIC COMPANY
77 Beale Street, B30A,
P.O. Box 770000
San Francisco, California 94177

WHEN RECORDED, MAIL TO:

State of California
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento California 95826
Attention: Charlie Ridenour , Chief
Northern California – Brownfields and Environmental Restoration Program

DRAFT

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

COVENANT TO RESTRICT USE OF PROPERTY

ENVIRONMENTAL RESTRICTION

Re: Assessor Parcel Number 009-0012-003
Pacific Gas and Electric Company

This Covenant and Agreement ("Covenant") is made by and between Pacific Gas and Electric Company ("Covenantor"), the current owner of property situated at 2000 Front Street in Sacramento, County of Sacramento, State of California, described in Exhibit "A", attached hereto and incorporated herein by this reference ("Property"), and the Department of Toxic Substances Control ("Department"). Pursuant to Civil Code section 1471, the Department has determined that this Covenant is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials as defined in Health and Safety Code section 25260. The Covenantor and Department, collectively referred to as the "Parties", hereby agree, pursuant to Civil Code section 1471, and Health and Safety Code section

25222.1 that the use of the Property be restricted as set forth in this Covenant; and the Parties further agree that the Covenant shall conform with the requirements of California Code of Regulations, title 22, section 67391.1.

ARTICLE I
STATEMENT OF FACTS

1.01. The Property, totaling approximately 6.4 acres is more particularly described and depicted in Exhibit "A". The Property is located in the area now generally bounded by the Sacramento River to the West, Front Street to the East, the California Automobile Museum to the South, and property owned by the Sacramento Housing Authority to the North in the City of Sacramento, County of Sacramento, State of California. The Property is more specifically described as Sacramento County Assessor Parcel Number 009-0012-003.

1.02. In May 1991 the Final Remediation Action Plan for the Property was submitted by Covenantor to the Department.

1.03. On May 19, 1993, the Department and the Covenantor entered into a Land Use Covenant (LUC) which restricted use of the Property. The 1993 LUC, among other restrictions, prohibits residential usage on the Property. The 1993 LUC shall, upon recordation of this Covenant, be superseded and shall have no further force or effect.

1.04. The May 1991 Final Remedial Action Plan has been implemented. Soil remediation on the Property is complete, having consisted of various soil removal actions and the construction of a geosynthetic clay liner (GCL) cap. The approved remedy for groundwater remediation has been implemented, consisting of intrinsic biodegradation of the adsorbed and dissolved contaminants of concern (COCs) through monitored natural attenuation (MNA), along with operation of groundwater and soil vapor extraction and treatment systems (GWETS and SVETS), maintenance of the GCL cap on the Property, hydraulic containment by production from the Ranney Collector, and recording of LUCs on each parcel of the Property.

1.05. In 2010, an evaluation of the remedy was completed as part of the implementation of a contingent remedy and an additional remedy was proposed for the Property. This additional remedy, *in-situ* soil solidification and stabilization (ISSS), was determined by the Department to better serve the purpose of reducing toxicity, mobility and volume through treatment, and was projected to attain cleanup goals in approximately five years of implementation. The additional remedy was formally selected when the Department adopted the Final Remedial Action Plan.dated _____.(Final Remedial Action Plan).

1.06. The ISSS implementation occurred in 201X over portions of the Property as described in the Final Remedial Action Plan, and constructed in conformance with the Department-approved design and implementation plan dated _____, and as depicted in Exhibit B. The Property was re-graded following the ISSS implementation, and a vegetated soil cap was placed over the ISSS area to minimize the possibility of direct human contact with the underlying soils. Other areas of the property are covered by the existing cap. Groundwater will continue to be monitored in accordance with the Final Remedial Action Plan until the Department determines that remedial action objectives have been attained.

1.07 The Department has concluded that the Property, as subject to restrictions of this Covenant, does not present an unacceptable threat to the environment or human health.

ARTICLE II
DEFINITIONS

2.01. Department. “Department” means the California Department of Toxic Substances Control and includes its successor agencies, if any.

2.02. Environmental Restrictions. “Environmental Restrictions” means all protective provisions, covenants, restrictions, prohibitions, and terms and conditions as set forth in any section of this Covenant.

2.03. Improvements. “Improvements” includes, but are not limited to: buildings, structures, roads, driveways, improved parking areas, wells, pipelines, or other utilities installations.

2.04. Lease. “Lease” means lease, rental agreement, or any other document that creates a right to use or occupy any portion of the Property.

2.05. Occupant. “Occupant” means Owners and any person or entity entitled by ownership, leasehold, or other legal relationship to the right to occupy any portion of the Property.

2.06. Owner. “Owner” means the Covenantor, its successors in interest, and their successors in interest, including heirs and assigns, which at any time hold title to all or any portion of the Property.

ARTICLE III
GENERAL PROVISIONS

3.01. Runs with the Land. This Covenant sets forth Environmental Restrictions that apply to and encumber the Property and every portion thereof no matter how it is improved, held, used, occupied, leased, sold, hypothecated, encumbered, or conveyed. This Covenant: (a) runs with the land pursuant to Health and Safety Code section 25355.5 and Civil Code section 1471; (b) inures to the benefit of and passes with each and every portion of the Property, (c) is for the benefit of, and is enforceable by the Department, and (d) is imposed upon the entire Property unless expressly stated as applicable only to a specific portion thereof.

3.02. Binding upon Owners/Occupants. Pursuant to the Health and Safety Code, this Covenant binds all owners of the Property, their heirs, successors, and assignees, and the agents, employees, and lessees of the owners, heirs, successors, and assignees. Pursuant to Civil Code section 1471, all successive owners of the Property are expressly bound hereby for the benefit of the Department.

3.03. Written Notice of the Presence of Hazardous Substances. Prior to the sale, lease or sublease of the Property, or any portion thereof, the owner, lessor, or sublessor shall give the buyer, lessee, or sublessee written notice of the existence of this Covenant and its Environmental Restrictions.

3.04. Incorporation into Deeds and Leases. This Covenant and its Environmental Restrictions shall be incorporated by reference in each and every deed and Lease for any portion of the Property.

3.05. Conveyance of Property. The Owner shall provide written notice to the Department not later than thirty (30) calendar days after any conveyance of any ownership interest in the Property (excluding mortgages, liens, Leases, and other non-possessory encumbrances). The written notice shall include the name and mailing address of the new owner of the Property and shall reference the Assessor Parcel Number (APN) as listed on page one of this Covenant. If the new owner's property has been assigned a different APN, each such APN that covers the Property must be provided. The Department shall not, by reason of this Covenant, have authority to approve, disapprove, or otherwise affect proposed conveyance, except as otherwise provided by law, by administrative order, or by a specific provision of this Covenant.

3.06. Costs of Administering the Covenant to be paid by Owner. The Department has incurred and will, in the future, incur costs associated with the administration of this Covenant including any inspection of the Property. Therefore, the Covenantor hereby covenants for the Covenantor and for all subsequent Owners that, pursuant to California Code of regulations, title 22, section 67391.1(h), the Owner agrees to pay the Department's costs of administering, implementing, and enforcing this Covenant.

3.07. Covenant Runs in Perpetuity. This Covenant runs in perpetuity unless modified or terminated in writing, signed by the Department and the Covenantor as set forth in Section 6.02.

ARTICLE IV
RESTRICTIONS

4.01. Prohibited Uses. The Property shall not be used for any of the following purposes:

(a) A single family residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.

(b) A hospital for humans.

(c) A public or private school for persons under 21 years of age.

(d) A day care center for children.

4.02. Soil Management.

(a) No activities that will disturb the soil (e.g., excavation, grading, removal, trenching, filling, earth movement or mining) shall be allowed on the Property without a Soil Management Plan approved by the Department.

(b) Any contaminated soils as defined in the Soil Management Plan brought from beneath the cap on the Property to the surface by grading, excavation, trenching or backfilling any such soils shall be managed in accordance with all applicable provisions of state and federal law.

(c) The Owner shall provide the Department written notice at least fourteen (14) calendar days prior to any building, filling, grading, mining or excavating at the Property.

4.03. Prohibited Activities. The following activities shall not be conducted at the Property:

(a) No Owners or Occupants of the Property or any portion thereof shall raise food or livestock in or on the soil;

(b) No Owners or Occupants of the Property or any portion thereof shall drill, bore, otherwise construct, or use a well for the purpose of extracting water

for any use, including, but not limited to, domestic, potable, or industrial uses, unless and until expressly permitted in writing by the Department.

(b) No Owners or Occupants of the Property or any portion thereof shall install, operate, or maintain a recharge or sedimentation control basin that is designed to infiltrate water unless and until expressly permitted in writing by the Department.

(c) No Owners or Occupants of the Property or any portion thereof shall install, operate, or maintain any injection wells for any use unless and until expressly permitted in writing by the Department.

(d) No Owners or Occupants of any portion of the Property shall conduct sustained extraction of the groundwater that is encountered during excavations for the construction of buildings or other improvements unless and until expressly permitted in writing by the Department.

4.04. Non-Interference with the Property.

(a) Activities that may disturb the Property (e.g. excavation, grading, removal, trenching, filling, earth movement, or mining) shall not be permitted on the Property without prior review and approval by the Department.

(b) No use of the Property shall disturb the integrity of the vegetated / clean soil or asphalt cap over the Property, unless the Covenantor, owner, occupant or lessee can demonstrate to the Department that the disturbance of the vegetated / clean soil or asphalt cap is necessary to the proposed use of the Property and will not increase any potential hazard to the public health and safety or the environment, or is necessary to reduce an imminent threat to the public health and safety or the environment and the Department approves such a use in writing.

(c) Owner shall notify the Department of each of the following: (i) the type, cause, location and date of any damage to the vegetated / clean soil or asphalt cap on the Property and (ii) the type and date of repair of such damage. Notification to the Department shall be made as provided below within ten (10) business days of both the discovery of any such disturbance

and the completion of any repairs. Timely and accurate notification by any person falling within the definition of Owner or Occupant shall satisfy this requirement on behalf of all persons falling within the definition of Owner and Occupant.

4.05. Non-Interference with Groundwater Monitoring Wells on the Property.

(a) Activities that may disturb the Groundwater Monitoring Wells (e.g. excavation, grading, removal, trenching, filling, earth movement, or mining) shall not be permitted on the Property without prior written approval by the Department.

(b) All uses and development of the Property shall preserve the integrity or effectiveness of the Groundwater Monitoring Wells.

(c) The Groundwater Monitoring Wells shall not be altered without prior written approval by the Department.

(d) Covenantor shall notify the Department of the type, cause, location and date of any damage to the Groundwater Monitoring Wells, if known. Notification to the Department shall be made as provided below within ten (10) business days of discovery of any such disturbance. Timely and accurate notification by any Owner or Occupant shall satisfy this requirement on behalf of the Covenantor and all other Owners and Occupants for the particular incident/damage reported.

4.06. Enforceable Operation and Maintenance Agreement. An Operation and Maintenance Agreement (Enforceable Agreement Docket Number HAS-O&M 07/08-074) which provides for the continued operation, maintenance and monitoring of the remedial systems necessary to protect public health has been executed and is in place, and its implementation is the responsibility of the Owner.

4.07. Access for Department. The Department shall have reasonable right of entry and access to the Property for inspection, monitoring, and other activities consistent

with the purposes of this Covenant as deemed necessary by the Department in order to protect the public health or safety, or the environment.

4.08. Access for Implementing Operation and Maintenance. The entity or person responsible for implementing any required Operation and Maintenance activities shall have reasonable right of entry and access to the Property for the purpose of implementing the Operation and Maintenance activities until the Department determines that no further Operation and Maintenance is required.

4.09. Inspection and Reporting Requirements. The Owner shall conduct an annual inspection of the Property verifying compliance with this Covenant, and shall submit an annual inspection report to the Department for its approval by January 15th of each year. The annual inspection report must include the dates, times, and names of those who conducted the inspection and reviewed the annual inspection report. It also shall describe how the observations were performed that were the basis for the statements and conclusion in the annual inspection report (e.g., drive by, fly over, walk in, etc.). If violations are noted, the annual inspection report must detail the steps taken to return to compliance. If the Owner identifies any violations of this Covenant during the annual inspections or at any other time, the Owner must within 10 days of identifying the violation: determine the identity of the party in violation, send a letter advising the party of the violation of the Covenant, and demand that the violation ceases immediately. Additionally, copies of any correspondence related to the violation of this Covenant shall be sent to the Department within 10 days of its original transmission.

ARTICLE V
ENFORCEMENT

5.01. Enforcement. Failure of the Owner or Occupant to comply with this Covenant shall be grounds for the Department to require modification or removal of any Improvements constructed or placed upon any portion of the Property in violation of this Covenant. Violation of this Covenant, including but not limited to, failure to submit, or the submission of any false statement, record or report to the Department, shall be grounds for the Department to pursue administrative, civil or criminal actions, as provided by law.

ARTICLE VI
VARIANCE, TERMINATION, AND TERM

6.01. Variance. Covenantor, or any other aggrieved person, may apply to the Department for a written variance from the provisions of this Covenant. Such application shall be made in accordance with Health and Safety Code section 25233.

6.02. Termination or Modification. Owner, or any other aggrieved person, may apply to the Department for a termination or modification of one or more terms of this Covenant as they apply to all or any portion of the Property. Such application shall be made in accordance with Health and Safety Code section 25234.

6.03. Term. Unless ended in accordance with paragraph 6.02, by law, or by the Department in the exercise of its discretion, this Covenant shall continue in effect in perpetuity.

ARTICLE VII
MISCELLANEOUS

7.01. No Dedication Intended. Nothing set forth in this Covenant shall be construed to be a gift or dedication, or offer of a gift or dedication, of the Property, or any portion thereof to the general public or anyone else for any purpose whatsoever.

7.02. Department References. All references to the Department include successor agencies/departments or other successor entity.

7.03. Recordation. The Covenantor shall record this Covenant, with all referenced Exhibits, in the County of Sacramento within ten (10) business days of the Covenantor's receipt of a fully executed original.

7.04. Notices. Whenever any person gives or serves any Notice ("Notice" as used herein includes any demand or other communication with respect to this Covenant), each such Notice shall be in writing and shall be deemed effective: (1) when delivered, if

personally delivered to the person being served or to an officer of a corporate party being served, or (2) three (3) business days after deposit in the mail, if mailed by United States mail, postage paid, certified, return receipt requested:

To Owner:

Pacific Gas and Electric Company
P.O. Box 7442, M/C B30A
San Francisco, CA 94105
Attn: Director, Environmental and Land Litigation

To Department:

Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200
Attn: Performance Manager, Brownfields and Environmental Restoration Program

Any party may change its address or the individual to whose attention a Notice is to be sent by giving written Notice in compliance with this paragraph.

7.05. Partial Invalidity. If this Covenant or any of its terms are determined by a court of competent jurisdiction to be invalid for any reason, the surviving portions of this Covenant shall remain in full force and effect as if such portion found invalid had not been included herein.

7.06. Statutory References. All statutory references include successor provisions.

IN WITNESS WHEREOF, the Parties execute this Covenant.

Covenantor:

By: _____ Date: _____

Title:

By: _____ Date: _____

Title:
Department of Toxic Substances Control

STATE OF CALIFORNIA)
)
COUNTY OF SACRAMENTO _____ _)

On this _____ day of _____, in the year _____, before me _____, personally appeared _____ personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

EXHIBIT "A"

APN 009-0012-003

The parcel of land situate in the City of Sacramento, County of Sacramento, State of California, described as follows:

The real property described in the judgment, wherein Pacific Gas and Electric Company is plaintiff, dated August 24, 1961 and recorded in Book 4297 of Official Records at Page 228, Sacramento County Records; excepting, therefrom the portion thereof lying on the southeasterly side of the southeasterly boundary line of the parcel of land conveyed by Sacramento Southern Railroad Company to Sacramento Electric Gas and Railway Company, by deed dated December 23, 1907 and recorded in Book 265 of Deeds at page 163, Sacramento County Records.

EXHIBIT "B"

CAP AREA

The map of the cap area will be

an “as-built” that is a survey of the

area once ISSS is complete.